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ABSTRACT

This industrial arts curriculum guide for drafting is divided into two parts. The information in Part 1, Overview, should be considered directions for delineating the requirements of physical facilities, tools, instruments, equipments, machines, instructional materials, procedures, processes for guidance, research, implementation, and evaluation of any (K-12) drafting situation. Part 2, Behavioral Objectives, begins with a section of selected behavioral objectives related to drafting and design technology from which the teacher may select and/or develop his own set. The next section presents information for curriculum implementation in Industrial Drawing (40 areas of involvement) and Architectural Drawing (5 areas of involvement). Information, presented in chart format for each area of involvement, includes (1) further description or outline of the area of involvement, (2) designation of appropriate course level (I, II, III, IV) and grade (K/6, 5/9, 9/12), and (3) discussion of goals general for the worlds of work, recreation, living, and related. (YLB)

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INDUSTRIAL ARTS CURRICULUM GUIDE

FOR

DRAFTING

State Department of Education
Division of Vocational Education
Bureau of Vocational Services
May, 1980

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PART I

Overview

PREFACE

The information within Part I, the Overview, should be considered directions for delineating the physical facilities, tools, instruments, equipment, machines, instructional materials, procedures, processes for guidance, research, implementation, and evaluation for any drafting situation.

The user (instructor) will spell out his or her own course specifics to meet the local needs and the requirements of the student and the community. The instructor will achieve the general established goals by drawing heavily upon the selected behavioral objectives related to Drafting and Design Technology included in the Part II Implementation Unit.

TERMINOLOGY

1. *A goal is a general statement, while an objective clearly specifies what must be done and how the activities will be measured.*

2. *a) Behavior involving manual, motor, neuro-muscular, or physical skills, are psychomotor behaviors.*

   b) Behavior dealing with feelings, emotions, attitudes, values, interests, and appreciations are affective behaviors.

   c) Behavior dealing primarily with mental or intellectual processes are cognitive behaviors.

   d) Overt and covert behaviors are classified in three domains; the cognitive, the affective, and the psychomotor. The use of domains will simplify the specification of objectives. Few behavioral objectives are purely cognitive, affective or psychomotor. We would be more accurate to state that the objectives are predominantly cognitive, or psychomotor, or affective.

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SPECIFICALLY

This project was begun under the auspices of and encouraged by Dr. G. Wesley Ketcham, past consultant for Industrial Arts Education, State Department of Education, Hartford, Connecticut,

and

completed under the tenure of and with the support of David M. Mordavsky, present consultant for Industrial Arts, Bureau of Vocational Services, State Department of Education, Hartford, Connecticut.

Our deep felt appreciation go to the above leaders for their active support and involvement in making this document possible.

The active drafting committee which is responsible for this document of work; the Overview, Part A, and the Implementation Section, Part B, in this month of May 1980, is composed of:

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Werner R. Friess

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FORWARD

This curriculum is the crystallization of many years of established need for the teacher in the classroom, the director or department head faced with planning, the principal in charge of curricula, the superintendent guiding the board and providing direction for any school system, and most of all, the youngsters approaching the threshold of adolescence and adulthood. The need is one of guidance and direction, of established minimals and suggested maxima, of width and breadth, of perceptive identification and clarification to and for the total field of Drafting as it exists in today's world, whether it be in the activity of "living, work, or play", and to this must be added definite overtones for tomorrow.

To this end, this effort has been developed cooperatively by the teachers and administrators in the Industrial Arts area of Drafting and its state affiliation, the Connecticut Industrial Arts Leadership Conference.

GENERAL GOALS

I. Goals of Contemporary Industrial Arts Education

In the process of determining goals for Industrial Arts, an exhaustive research of our own Connecticut State educational data, as well as the leading literature, authors and documents, centralizes upon the following:[1] "Many of the objectives and the goals of Industrial Arts in the past were either repetitious or geared to the popular theories of the psychology of the times. As a result, the program and its justification were open to criticism when such theories were either generally abandoned or simply discarded in favor of newer or more exciting theories of the learning process...a) What is Industrial Arts attempting to accomplish in the school system, and b) How does it propose to accomplish whatever it is that it is purposing to do?...

"An analysis of Industrial Arts goals developed in the past reveals that many of the goals were untenable; others, controversial. To provide a sound program of Industrial Arts, clear, realistic goals are essential. These five are being advocated and are believed to be unique to Industrial Arts:

A. Develop an Insight and Understanding of Industry and its place in Our Culture.

B. Discover and Develop Talent, Aptitudes, Interests and Potentialities of Individuals for the Technical Pursuits and the Applied Sciences.

C. Develop an Understanding of Industrial Processes and the Practical Application of Scientific Principles.

D. Develop Basic Skills in the Proper Use of Common Industrial Tools, Machines, and Processes.

E. Develop Problem Solving and Creative Abilities Involving the Materials, Processes and Products of Industry."

---

[1] Lindbeck, J.R., Practical Guide to Industrial Arts Education, The Center for Applied Research in Education, Inc., New York, 1972, pp. 36-37.

II. The Grade Level Breakdown of Industrial Arts Drafting

A. K-4 or K-5 = Primary

1. Specific Goals of the Area - Primary (Level One)

a. Grades K-5, or K-6, first informal introduction to the drafting area.

Drafting in the simplest form, that of orderly planning and pictorial direction, ought to be integrated and be an experiential part of all the learning areas commensurate with grades K-5, or K-6. Specifically, K-6 would utilize the following applied goals primarily as a means of thinking through, and by their use, chart directions of construction and understanding, and use these to enhance, i.e., to make richer and more meaningful, any and all areas of said elementary learning, including those career aspects of Total Drafting that are found in the geographic neighborhood.

2. Applied Goals Breakdown

a. How to follow directions
b. Development of neatness
c. Disciplined reasoning
d. Development of visual relationships
e. Developing use of pictorial directions
f. Interpretation of other works
g. How to design functionally (and esthetically)
h. How to read graphs
i. How to read maps
j. Development of vocabulary with regard to above
k. Note: The main purpose of the foregoing is to enhance the existing areas of learning, i.e., to make them broader, richer, and more meaningful for the youngsters concerned.

1. At this time exposure to the career aspects of the Industrial Arts should take place, particularly as they affect the children's immediate and more distant neighborhoods.[A]

[A] It should be noted that much learning occurs by observation and various experiences, particularly where the very young are concerned. The local caterer, mason, cabinetmaker, policeman, nurse, dentist, milkman, grocer, etc., in terms of living and practicing in the neighborhood. These people are all involved in making impressions on the young minds and to a goodly degree, formulating the beginnings of life-long habits.

B. Grades 5-8, 6-9, or 7-9 = Intermediate (Level Two)

1. Specific Goals of the Area - Intermediate (Level Two)

a. Grades 5-8, 6-8, 6-9, or 7-9, Exploratory, Phase One

Drafting at this stage, applied to the middle and/or junior high school level, ought to lend itself to a functional dealing with problems of everyday concern at the interest levels of the group to be served. Activities ought to manifest the importance of reading prints, planning, and designing, and of drafting generally as it relates to all industrial and technical areas, i.e., the activities of manufacturing, construction, power, and related graphics such as for woods, plastics, metals, electricity, electronics, graphing, maps of homes, charts, etc.[1] Specifically then, the emphasis ought to be in exploration rather than specialization with the technique of problem solving utilized heavily as a group or individual activity level in the meaningful solution of relevant problems...for all students, both boys and girls. In addition, the second phase of career education/orientation should crystallize at this, the second level.

b. Applied Goals Breakdown...To Develop:

1. Cleanliness, neatness, and orderliness

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[1] Ketcham, G. Wesley, PhD., "Dare We Say I. A. For All?", December 1967, p.2.

2. Critical thinking
3. Resourcefulness
4. The ability to follow directions
5. The ability to make freehand sketches
6. The ability to read drawings
7. The ability to visualize abstractions
8. The ability to create
9. Perseverance
10. Honesty
11. Time consciousness
12. Accuracy
13. Open mindedness
14. Self-dependence
15. Self-discipline
16. The ability to develop academic skills in relation to drafting
17. The ability to make simple, formal drawings
18. To develop an appreciation of industry's mode of communication
19. To develop a sense of responsibility
20. To develop some knowledge and skills in the use of materials and tools on the first formal step of the Drafting pyramid.[1]

C. Grades 9-12, or 10-12 = Secondary (Level Three)

1. Specific Goals of the Area- Secondary (Level Three)

a. Grades 9-12, or 10-12, Exploratory, Phase Two; Specialization, Phase One

Drafting, as applied to the high school grades 9 or 10 to 12, ought to initially evolve from exploratory orientation to one of concentration with the world of work or career orientation. Experiences with tools, processes, and materials in the applied solutions of problems of concern- group and individual- ought to point toward functional consumer adaptation, to college or institute, and to vocational skill requirements at the highest level of specialization.

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[1] C.I.A.A., C.I.A.L.C., July 1971.

[2] Idem.

Specifically, the goal ought to be one of developing in each student a degree of skill in the utilization of drafting instruments and equipment which will enable him to express ideas graphically and to solve everyday problems according to accepted drafting standards.[1]

Yet, sight should not be lost of interdisciplinary application of as many drafting elements as are feasible. Functional correlation with the balance of the high school curriculum ought to be pursued for a meaningful total experience.

b. Applied Goals Breakdown

1. Accuracy/Precision
2. Speed/Time Consciousness
3. Legibility
4. Neatness
5. Critical Thinking, Problem Solving, Research and Development
6. Development of orderly, systematic sequence of operations
7. Consumer Awareness
8. Sense of Responsibility
9. Principles of Standardization
10. Leisure Time Utilization
11. Occupational Orientation
12. Personal Traits (Habits and Attitudes)[2]
    a. Cooperation
    b. Leadership and fellowship
    c. Understanding
    d. Appreciation of achievement
    e. Honesty
    f. Perseverance
    g. Cleanliness/personal

D. Grade 9 Clarification:

It should be noted that the 9th grader, the Freshman, is normally in the throes of evolving adolescence. He is neither a child nor a true adult, and therefore, should have tailored

---

[1] Milwaukee Drafting Guide, "Objectives, Grades 7-10", 1962, p.22.

[2] Estabrooke & Karch, 250 Teaching Techniques, 1947, p. 104

for him an experiential area of drafting. Although career oriented, it nevertheless ought to be involved with both exposure and some skill learning depending on the student's needs and desires, in that order. This will insure the desired broad base where both abstract and relevant problem solving occur. To reemphasize, the accent here is on fundamentals through applied exploration rather than on specifics, as opposed to the vocational approach.

E. *Grade 10 Clarification:*

This area ought to be the first step of the sequence of functional drafting experiences. These are experiences which not only provide additional career orientation, but very basic and fundamental learning. They should embody the best of the old Mechanical Drawing I, plus essential enrichment relative to student needs and industrial practice. Add to this increasing college and technological demands.

F. *Grade 11 Clarification:*

This area ought to be the second step of the formal drafting sequence. In fact, it ought to be the first real stage of specialization in career orientation. This category is based on interest and ability, the second step beyond basic General Drafting as offered at the 9th grade level.

G. *Grade 12 Clarification:*

This area, the third step of the formal drafting sequence, is based largely on the interests and abilities demonstrated. During this period of intensive specialization, greater time allotments should be considered. In-depth refinement of attitudes and skills relatedto the area of specialization will result in the decided enhancement of marketable skill(s). Specialization in varying aspects of the advanced drafting offerings should lead to functional articulation with the college and technological demands and to the development of job entry skills as applied to the world of work.

III. Time Involved (Overall length of programs)

The time span for a program is governed by many factors within any school system. The time involved for any program could be composed of the following time blocks:

A. Yearly

B. Semestral

C. Quarterly

D. Weekly

E. Daily

F. Any other

IV. Course Level

It should be noted that no curriculum guide ought to be used in grades K through 5 or 6 where Industrial Arts in general serves to enhance the existing program only. (No breakdown follows here.)

In the middle school, 5-8, or junior high, 7-9, the course level of Drafting should point towards orientation into the broad areas of Drafting as applied to the worlds of work, of living, and of leisure time. It must be noted again, that this course level should be Industrial Arts, not vocationally oriented. It should be correlated with the existing programs wherever and whenever possible.[A] A greater emphasis can be placed on career orientation, the world of work, only as the 9th grade level is reached. At this time, the Drafting offering might well be the first formal drafting course experienced by those students who indicate an aptitude for college and technical or scientific education.

[A] This would be interdisciplinary education in the finest, most functional form. (The editors)

A. Grades 6-7-8

1. Exploratory in nature
2. Open to all
3. Emphasis on everyday problem solving relative to school/home/community
4. Activities should encompass all three centers of concern:
   - a. World of Living
   - b. World of Leisure
   - c. World of Work (in individual and group activities)

B. Grades 9, or 10-12

1. Exposure relative to enrichment for other disciplines, i.e., Sciences, Mathematics, Fine Arts, Consumer Core, Business Education, Home Economics, etc.
   - a. Fundamental use of tools
   - b. Lettering
   - c. Spatial Relations, etc.

2. Career Orientation
   - a. College preparation - engineering institutes
   - b. Vocational/technical/industrial
   - c. Terminal and/or conjunction with bonafide industrial application - outside of school

3. Leisure Time/Consumer Competence

This area should be open to anyone with or without prior drafting experience. It is strictly needs-centered relating to the worlds of living and play. As such, it would provide overview and exposure only, with no attempt at skills or industrial techniques. It should provide an insight into the language of industry so as to better be able to cope with it in its many ramifications for better consumer living, as well as more enjoyable leisure time participation. This experience area could well be the correlation catalyst which will make other disciplines functionally meaningful. To insure this aspect, it ought to be provided on a 1/4, a 1/2, and a 1 semester approach, or any combination thereof. This will provide a greater participation and better mating of course offerings.

4. Student Course Level
    a. Refer to individual courses, i.e.;
        1) General Drafting I (9, 10, 11, 12)
        2) Drafting II (10, 11, 12)
        3) Drafting III (11, 12)
        4) Drafting IV (12)
        5) Architectural I (10, 11, 12)
        6) Architectural II (11, 12)
        7) Architectural III (12)
        8) Drafting V (Special situations)
        9) Exceptional student

V. Size of Class

Industrial Arts, as a discipline, ought to have no bearing on the class size of grades 4, 5, or 6. More demanding criteria, other than Industrial Arts centered activities, govern this.[1]

Increasingly, however, from 5, 6, or 7, on through grade 12, class size does become a factor. For, since individualization and specialization are ultimately desirable for the fullest realization of individual potential , classes should not be overloaded at this latter stage.

Therefore, factors of concern are actual space commitment, pupil demand, administrative policy governing class size, and state recommendations[A] for minimal plant size re: pupil ASSIGNMENT. Realistically, a new educational situation, plant offering, and desire for state aid, must meet the basic minimals of 48 square feet per pupil for Drafting to qualify. In addition, the state-suggested maximum number of pupils for this type of activity class is twenty-five (25) for one teacher. Thus, any local administration may act accordingly, since local control is basic. It may accept or reject state guidance and, therefore, reimbursement as well!

[A] Note: Relative to footnote 1, above, if the state grants-in-aid package for Industrial Arts is in effect, then "recommendations" become very firm and rigid "requirements"!

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[1] Bureau of School Buildings, Hartford, "Table of Recommended and Minimum Areas for Educational Facilities", Connecticut State Department of Education, re: class size, physical facilities, and pupil state aid, p. 1.

VI. Instructional Methods and Devices (Multi-Media) [1]

Because we are involved in education for life in a democratic society, it must be recognized that although the end results are important, the methodology or means involved in this process, which is ultimately measured in changed behavior, is almost overwhelmingly always the more important of the two. The end seldom justifies the means.

Yet, by way of contrast, Industry, which we are exploring, is not always democratic. It is governed by the finished product and consumer acceptance...authoritarian, if you will. The engineer must know how to subordinate himself for the good of a process, a recognized need, material progress, etc., so occasionally must a youngster, for the sake of the class. Through the debris of dictatorial decisions, disruptive strikes, etc., all symptoms of a sick society, it has been painstakingly discovered that mere recognition of material achievement and reward does not outweigh the dignity of the individual and the respect and appreciation for him as a human being. Thus, Industry has increasingly moved to correct this oversight when and wherever feasible. It has increasingly, and is continuing to include the individual in the "grass roots" of decision making and the formulation of policies which in any way affect him.

Small as it may be, the progress made in recognizing the individual, in treating him as a human being and not as a machine, appears to be paying off. The atmosphere for planning, for creating, and for accomplishment seems to have tremendously improved. Where unions have not seized some of management's prerogatives, even the finished industrial product, today, shows improvement. The end, even here, seldom justifies the means. And so the following are presented as methods and devices for instruction...cooperative in nature wherever and whenever feasible to the degree maturation is evidenced.

A. Demonstrations

  1. Class
  2. Individual
  3. Group

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[1] I.A. Curriculum, Westport, Connecticut, 1960, Revised 1970, p.17, "Drafting Section I."

It should be understood that any multi-media materials should not be used in lieu of the classroom teacher alone. These materials in any curriculum are both pertinent and vital in making any area of learning more enjoyable, vital, and adaptable to the student and his needs.

B. Lectures

  1. Plain
  2. Illustrated

C. Discussion

  1. Group
  2. Individual

D. Printed Materials

  1. Textbook(s)
  2. Reference books
  3. Magazines
  4. Pamphlets
  5. Instruction sheets
     a. operation
     b. job
     c. information
     d. assignment

E. Field Trips

F. Motion Pictures with Projector

G. Film Strips/Slides; Projectors/Viewers (multi or individual) with or without sound capabilities

H. Transparencies with Overhead Projector

  1. Can be used for silhouette effect
  2. Can be used as secondary "chalk board"

I. Opaques/Projector

  1. Illustrations
  2. Photos, etc.

J. Models

K. Diagrams

L. Dioramas

M. Charts, maps

N. Chalk Boards

  1. Slate (preferred)
  2. Accessories
    a. assorted chalks
    b. erasers
    c. instruments
    d. triangles
    e. T-squares
    f. compass
    g. drafting machine
    h. demo "scale"
    i. protractors
    j. isometric graph-scored board
    k. straight edge

O. Flannel Boards

  1. Demonstration lecture materials
  2. Discussion core, means of
  3. Individual information source

P. Bulletin Boards

  1. Stationary
  2. Portable
  3. Magnetic

Q. Empirical Method

R. Radio/Television (if and when possible)

S. Video Tape[A]

T. Resource Personnel (especially local)

U. Records (disc)

V. Tape record/playback equipment

W. Closed Circuit Television

X. Computer Drafting

VII. Scoring Methods

The method of scoring will differ relative to the community and the existing educational philosophy. It may be one, or a combination of the following:

1. Numerical
2. Alphabetical
3. Narrative
4. Pass/Fail or No Record

Classwork, testing, and homework ought to enter into the gauging of an individual's progress - objective where pure drafting information is required, and psychologically subjective where individual growth is concerned.

In terms of the stated objectives compatible with the varied drafting areas, the following are presented as tentative guides which will do the job if objective reporting is adhered to in terms of categorical subdivision.

[A] Note: Above materials may be subjected to justification. The following items are intended for justification purposes: 1) Educational, 2) Special; 3) Informational.

A. Student Progress[A]

1. Projects (problem solving and assigned) 50% of Grade
    a. Classroom use of time
    b. Homework achievement

2. Related Work 10% of Grade
    a. Testing (quizzes and exams)
    b. Research papers (report writing/verbal presentation)

3. Shop Work 20% of Grade[B]
    a. Proper use of shop
    b. Proper use of equipment
    c. Proper use of materials

4. Personal Achievement 20% of Grade
    a. Cooperation (interest, leadership)
    b. Promptness (punctuality)
    c. Self-reliance (constructive judgement)
    d. Industry (drive, initiative, perseverance)
    e. Responsibility (dependability)
    f. Honesty (integrity/The Golden Rule)

VIII. Categorical Listing of Pertinent Industrial Arts Reference Materials

It is suggested that in order to prevent duplication of effort, and to save time, all books, magazines, and other courses of study (whether local, regional, or distantly removed) should be researched to determine the utilization of prior accomplished work, if possible. This will provide a more comprehensive understanding of the problem. In fact, very probably, other curriculum or courses of study or materials, wholly or in part, may be of use.[1]

[A] This interpretation will probably vary from teacher to teacher; it is suggestive only.

[B] Proper use implies safe use.

[1] Estabrook and Karch, op. cit., p. 116.

Reference material breakdown as follows:

A. Educational

    1. Psychological
    2. Philosophical
    3. Social Sciences
    4. Test and Measurement

B. Methods

    1. Audio-Visuals
    2. Teaching procedures and techniques
    3. Trade and job analysis

C. Technical

    1. All present-day confirmed Drafting book publications
    2. Mil standards
    3. S.A.E. standards
    4. A.S.A standards
    5. A.N.S.I. standards (American National Standards)
    6. S.I. Metric

D. Magazines

    1. Architectural
    2. Engineering
    3. Design
    4. Popular Engineering and Construction oriented
    5. Professional journals

E. Pamphlets

    1. Research
    2. Analyses
    3. Dissertations

IX. Student Personnel Organization

In order to achieve a maximal teaching result, especially for this, our democratic society, student involvement ought to be actively sought and encouraged. Suggested is a breakdown which has proven to be effective in many drafting situations, with the understanding that class layout, room size, and shape are at the teacher's discretion.

A. *Teacher: Not in front of class, but on side where he can more effectively oversee the operations on a platform with lecture layout (table) and the chalk board behind him... also, raised so bottom of chalk board will be above desk height and lecture layout table. This will permit full board viewing for all students. This could also be home base for all audio-visual use, as well as the light table center.*

B. *Class*

1. *Students on equal status*
2. *Foreman to be in charge of school tools and equipment*[A]

C. *Cleanup*

1. *Students clean own work areas and properly store tools*
2. *Checked by foreman*
3. *Confirmed by teacher and graded then and there*

X. Text and Reference Book Publishers and Authors

Texts as presently used in Drafting should be based on the new American National Standards Institute (ANSI), replacing the old ASA and Mil Standards. Continued use of the SAE Standards will provide a complete core. Industrial complementation should be sought especially those documents published by the American Society of Mechanical Engineers; the A.N.S.I. units, 45 in number.

[A] *Note: Tools and equipment not belonging to the students ought to be centralized and available for student use when necessary. The suggestion is a responsibly controlled center which the Foreman operates, thus freeing the teacher for teaching.*

A. The largest drafting text publishers presently appear to be:[A]

1. American Technical Society
2. Charles Bennett Company
3. Bruce Publishing
4. Delmar
5. Goodheart Wilcox
6. Macmillan
7. McGraw Hill
8. McKnight & McKnight
9. Prentice-Hall
10. Van Nostrand
11. John Wiley

B. Some of the leading authors in drafting publications presently appear to be:[B]

1. Bannister
2. Beukema
3. Coover
4. Dalzell
5. Dygden
6. French
7. Giachino
8. Giesecke
9. Heppler
10. Hornung
11. Jensen
12. Keppler
13. Kicklighter
14. Luzzader
15. Wright
16. Ramsay
17. Sleeper
18. Spence
19. Svenson

[A] Note: These should be constantly updated by all concerned personnel.

[B] Note: These should constantly be updated by all concerned personnel.

20. Svenson
21. Townsend
22. Vierck
23. Waffle
24. Wallach
25. Yankee
26. Zozzora

XI. Equipment and Tools to be Used

A. Drafting Tables

1. Conventional (i.e., Stacor type/modern version) (H.S. - Jr. H.S. - M.S.)
2. Industrial/professional unit (H.S.)
3. Adjustable, pedestal type unit (H.S.)
4. Refer to major manufacturers of drafting tables
    a. Bruning
    b. Dietzgen
    c. Hamilton
    d. Keufel & Esser
    e. Lyons
    f. Parent
    g. Post
    h. Stacor, etc.

B. Seating Units - A, 1 above

C. Drawing Boards

1. Built-in surfaces (fixed or adjustable position)
2. Portable drawing board
    a. Plain
    b. Built-in straight edge
    c. Drafting machine (table or chalk board mounted)
    d. Klok-Perspective board
    e. Light table

D. Reproduction Machine (blue, white prints or multi-colored)

    1. Ozalid
    2. Diazo
    3. Combination developer/printer or piggyback version

E. Reproduction Paper Center

F. Paper

    1. Opaque
        a. Conventional drawing paper A through F
        b. Graph(s)
        c. Rendition
    2. Transparency
        a. Tissue, wrapping type
        b. Onion skin
        c. Vellum
        d. Cloth
        e. Vinyl
        f. Mylar

G. Inks

    1. India, black
    2. Colored

H. Paints (rendering, non-oil)

    1. Brush
    2. Spray (air brush)
    3. Wash (paint/pencil)

I. Dry Rendering

    1. Chalks, pastels
    2. Charcoal
    3. Carbon pencil
    4. Conventional colored pencils (dry and water soluble)
    5. Wax Crayons - pencils

J. Rub and Paste-Ons

1. Surface Textures
2. Pattern (conventional patterns/crosshatch symbology/commercially available)
3. Lines, Letters, etc.

K. General Storage Facilities

1. Counter type
2. Wall cabinet (hanging)
3. Upright cabinet, floor
4. Bookcases
5. Drawing file cabinet
6. File cabinets (fixed and/or portable)
7. Tool and instructor equipment cabinet panel(s)
8. Individual student desk storage facilities

L. Teacher Facilities

1. Desk
2. Chair
3. Table
4. Files

M. Instructional Media Materials (refer to Section VIII of the Overview for listing)

N. General Drafting

1. Paper cutter (24" x 36")
2. Pantograph
3. Parallel ruler (12" or 18")
4. Straight edge (36" - 48")
5. T-squares (30" - 36" - 42")
6. T-squares, adjustable (30" - 36")

6) Missile and space
7) Sine curves and variable wave forms
8) Transistor outline
9) Tube
10) Wiring
d. Piping/Valve
1) Fittings
2) Ferrous flanged valves
3) Flow
4) Gate valves
5) Large valves
6) Piping - single line, etc.
e. Mechanical Engineering (welding)
1) Symbols
2) Fittings
f. Structural
g. Architectural
1) House plan
2) Landscape
3) Detail (stairs, roofs, etc.)
h. Civil Engineers (mapping traffic and highways)
1) Roads and bridges
2) Topographic, etc.
i. General Purpose
1) Arrowheads
2) Compass directional, etc.
11. Drawing Instruments (pen, ink, divider)
a. Bow Tools (1/8" to 2" radius)
b. Drop Bow Compass
c. Master Bow Compass (2" to 6")
d. Friction Compass (2" to 6")
e. Quick Set (2" to 6")
f. Extension Type (6" to 14")
g. Ruling Pens
1) Single nibs
2) Multiple nibs
3) Contour

7. Triangles
    a. 30°/60°/90° (6" to 18")[A]
    b. 45°/ 45°/ 90° (6" to 18")
    c. Adjustable type
        1) 6" and 12" size
        2) 1/2° units
        3) Trigonometry functions
8. Lettering guides and instruments
    a. Lettering guides (Ames & Braddack-Rowe types)
    b. Alpha-Numeric templates
    c. Lettering sets
        1) Wrico-Leroy types
        2) Built-up letters
9. Irregular curves
    a. Regular French curves
    b. Copenhagen Ship and Railroad curves
    c. Splines and "Ducks"
    d. Universal (Flex) curve
10. Templates
    a. Basic geometric
        1) Circles
        2) Ellipses
        3) General purpose
        4) Squares and triangles
    b. Machine
        1) Fasteners
        2) Gears
        3) Welding symbols
    c. Electricity/Electronics
        1) Circuit aid
        2) Electric power
        3) Electric public utilities
        4) Electrical switch
        5) Logic symbols

[A] 6" triangles should be used for primary grades and a 10" to 18" triangle in M.S./Jr. H.S./H.S.

- h. Technical Pens
    - 1) Fountain
    - 2) Speed Ball type
    - 3) Ball bearing

12. Cutting Devices
    - a. Scissors
    - b. X-Acto knives
    - c. Rotary drive trimmer
    - d. Paper slitter, hand held (used razor blades)
    - e. Utility knife

13. Cleaning Devices
    - a. Brush, table
    - b. Dusting
    - c. Rags
    - d. Erasure compounds
    - e. Erasures
        - 1) Rubber
        - 2) Plastic
        - 3) Gum
        - 4) Kneaded rubber
        - 5) Stick
    - f. Shields (plastic or stainless steel)

14. Miscellaneous Mechanical Devices (electrical or manual)
    - a. Eraser
    - b. Ultra-sonic cleaner
    - c. Lead pointers
    - d. Mechanical sharpeners
    - e. Pencil sharpener, Draftsman and regular

15. Fastening Devices and Materials
    - a. Stapler/staples
    - b. Tacks
    - c. Tape/dispenser(s)
        - 1) Drafting
        - 2) Mending
        - 3) Industrial binding
    - d. Spring clips
    - e. White glue
    - f. Rubber cement
    - g. Instant contact cement
    - h. Epoxy

16. *Pencil Devices*
    - a. *Wooden*
    - b. *Mechanical*
17. *Drawing "leads"*
    - a. *Grades 7B through 9H (black, colored, plastic)*
    - b. *Colored (dry or wet type)*
18. *Measuring Devices*
    - a. *Scales*
        - 1) *Architect's*
        - 2) *Engineer's mechanical*
        - 3) *Engineer's civil*
    - b. *Steel tapes*
    - c. *Protractors*
    - d. *Programmed math devices*
        - 1) *Slide rules*
        - 2) *Computers/calculators*
        - 3) *Conversion tables (i.e., Trig functions, Metric, etc.)*
    - e. *Perambulator (surveying instrument)*
    - f. *Optical/precision*
        - 1) *Level*
        - 2) *Transit*
        - 3) *Theodylite*
        - 4) *Sextant*
        - 5) *Tripod*
    - g. *Surveying materials, assorted*
        - 1) *Rods*
        - 2) *Chains*
        - 3) *Stadia*
        - 4) *Tapes*
        - 5) *Compass*
        - 6) *Plumb bob*
        - 7) *Markers*
        - 8) *Related math materials*

19. Precision Measuring Tools
    a. Micrometers
        1) Inside
        2) Outside
        3) Depth
    b. Calipers
        1) Vernier
        2) Hermaphrodite (inside, outside)
    c. Combination square with protractor
    d. Machinists' scales, 6"
    e. Gauges
        1) Gear Tooth
        2) Plug
        3) Ring
        4) Sheet metal
        5) Thread
        6) Wire
20. Maintenance/Repair Equipment and/or Tools and Materials
    a. Machinist's vise, bench type (small)
    b. Screw drivers, assorted
    c. Pliers
        1) Needle Nose
        2) Combination
    d. Hammer, machinist's (7 oz.)
    e. Files, jeweler's (Swiss type)
    f. Scrapers
    g. Steel wool (very fine)
    h. Abrasive paper/cloth
        a) carborundum
        b) emery
        3) crocus
    i. Punches, pin
    j. Chisels, cold
    k. Surface gauge
    l. V-Blocks with clamps
    m. Miniature anvil, 16 oz.
    n. Water soluble putty (for model-making use)
    o. Paper-mache (for model-making use)
    p. Paper punch, 1/4" hole

21. Student-Owned Tools[A]
    a. Following are examples of student materials
        1) Empty vinyl padded plastic tool containers
        2) Compasses
            a) Master Bow
            b) Bow tools (small)
        3) Inking devices, etc.

XII. Operations to be Learned

A. Use of Tools (K-12)

1. Pencils
2. Erasers and shields
3. Measuring implements
4. Triangles
5. T-squares
6. Papers
7. Boards
8. Drafting furniture
9. Drafting instruments
10. Specialty devices

B. Operations to be Learned

1. How to draw horizontal lines
2. How to draw vertical lines
3. How to draw angular lines
4. How to draw circles
5. How to draw arcs
6. How to draw rounds
7. How to draw fillets
8. How to draw tangencies
9. How to draw irregular curves

[A] Although school-supplied equipment has thus far been highlighted, students may, and in some situations, ought to provide their own equipment, particularly when homework is required.

10. How to draw capital letters (Alpha Numeric)
11. How to draw lower case letters (Alpha Numeric)
12. How to draw geometrics (when needed)
13. How to draw line bisectors
14. How to draw angular bisectors
15. How to divide a line into equal parts
16. How to draw line junctures
17. How to draw perpendiculars
18. How to draw to scale
19. How to draw single-view layouts
20. How to draw orthographically
21. How to draw freehand sketches
22. How to draw full sections
23. How to draw half sections
24. How to draw offset sections
25. How to draw broken-out sections
26. How to draw revolved sections
27. How to draw removed sections
28. How to draw outline sections
29. How to draw phantom sections
30. How to draw blacked-in sections
31. How to draw shaded-in sections
32. How to draw Isometric drawings
33. How to draw Dimetric drawings
34. How to draw Trimetric drawings
35. How to draw Cavalier drawings
36. How to draw Cabinet drawings
37. How to draw Exploded drawings
38. How to draw the Alphabet of Lines
39. How to draw Numbers
40. How to make out a Bill of Materials
41. How to make Title Blocks
42. How to make Note Placements
43. How to make out Specifications
44. How to make Leaders
45. How to make Parallel Line Developments
46. How to make Radial Line Developments
47. How to make Intersections

48. How to make Triangulations
49. How to make Plot Plans
50. How to make Contour Plans
51. How to make Plan Views
52. How to make Elevations
53. How to make Details
54. How to make Perspectives (1, 2, or 3-point)
55. How to make Renderings
56. How to make Symbols:
    a. Machine finish
    b. Architectural
    c. Electro/Electronic
    d. Welding
    e. Traffic control
    f. Piping
    g. Thread
    h. Gearing/cam
    i. Sectional
    j. Structural
57. How to do Inking
58. How to Reproduce Prints
59. How to Read Technical Drawings

XIII. Problems to be Solved

It should be noted that the specifics of this activity will be found Parts II and III of the Complete Drafting Program...these parts, relative to immediate breakdown, are Engineering Drafting (Graphics) and Architectural Drafting (Graphics). Such problems shall be presented which shall develop concepts and entry skills in the areas of work, living, and recreation.

XIV. Related Information to be Learned

Related knowledge and use of tools, equipment, and materials, shall cover the areas of the world in work, living and,recreation.

PART II

Behavioral Objectives

BEHAVIORAL OBJECTIVES

These objectives (following) are general in nature and selectively chosen to aid the teacher in developing his or her own unique set of behavioral objectives as they will apply to strictly localized needs and requirements. Selective here means a deliberate selection of those objectives that will best serve the teacher's, community's and student's needs in a functional appraisal of the frequent plethora of such objectives, often an exercise in exasperation.

This, then, is the introduction to the Part II Implementation Phase.

SELECTED BEHAVIORAL OBJECTIVES RELATED TO

DRAFTING AND DESIGN TECHNOLOGY

Upon completion of these units, the student will be able to:

Tools and Equipment:

- *A. List and identify various tools or instruments of the most commonly used by the drafter.*
- *B. Demonstrate proper use, care, and maintenance of the most frequently used instruments and equipment.*
- *C. Demonstrate proper use, capabilities, and maintenance of common drafting machines.*

Freehand Sketching:

- *A. Explain the basic techniques and principles of freehand sketching.*
- *B. Sketch the different types of pictorials.*

Lettering:

- *A. Demonstrate proper delineation of single stroke letters; both vertical and slanted techniques.*
- *B. Explain proper techniques of using numerals and fractions.*
- *C. Describe proper spacing of individual letters and words in note form.*
- *D. Identify common lettering templates and aides.*

Spatial Relations:

A. *List and identify standard line types and weights used on engineering drawings.*

B. *Generate these lines and define proper application.*

C. *Define orthographic projection.*

D. *Identify the four dihedral angles of projection.*

E. *Describe the principal planes of projection.*

F. *Explain folding line notation.*

G. *Identify and describe all types of lines and plane surfaces.*

H. *Describe the six basic views.*

I. *Differentiate between third and first angle projection.*

J. *Explain the spatial relationships of all lines and plane surfaces.*

K. *Demonstrate the transfer from orthographic views to three-dimensional drawings and vice ver*

L. *Generate a complete three-view drawing from two given views of partial information.*

M. *Correctly select, analyze, and position the views on the drawing paper.*

Data Presentation:

A. *Identify and describe the use of selected graphs.*

B. *Identify and explain the use of selected charts.*

C. *Identify and cite the different types of diagrams.*

D. *Identify and describe the use of selected map drawings.*

Sections:

A. Define the use and theory of sectional views.

B. List and define the commonly used types of sectional views, including the functions and proper applications of the various techniques.

C. Describe the commonly used sectional symbols and conventional practices in use today.

D. Differentiate between a section line and a cutting plane line.

Pictorials:

A. Define the use and theory of the three types of axonometric projections.

B. Explain isometric drawing principles including angles, curves, and isometric circles and cylinders.

C. Draw an isometric drawing depicting isometric dimensioning and sectioning techniques.

D. Describe the use and theory of the three types of oblique projections.

E. Explain oblique drawing principles including angles, curves and circles especially where contained in a receding plane surface.

F. Draw all types of oblique drawings illustrating correct dimensioning and sectioning procedures.

G. Explain the use and theory of the four types of perspective projections.

H. Identify and explain the common terms used in perspective projection.

I. Describe the treatment of angles, curves, and circles on perspective drawings.

Auxiliaries:

A. Define the use and theory of primary and successive auxiliary views.

B. Describe the techniques and procedures used in generating normal views of all lines, skewed and inclined plane surfaces.

C. List the steps followed in generating any auxiliary view.

D. Identify and label the proper fold line notation.

E. Differentiate between and explain the folding-line and reference-plane methods of plotting an auxiliary view.

F. Explain the different reference plane systems.

G. Plot any curved surface using projection techniques.

H. Explain the spatial relationships of the line of sight and the folding line.

Revolutions:

A. Describe the theory of and use of the revolution process in drafting.

B. Explain the techniques and procedures used in generating normal surfaces and ture length lines.

C. Explain how counter-revolution is used.

Intersections and Developments:

A. Describe the procedures used in finding a piercing point, line of intersection, or figure of intersection.

B. Identify and explain radial line, parallel line and triangulation developments.

C. Show with a model how each method of development is accomplished.

Vector Geometry:

A. Explain how engineering and scientific data solutions can be obtained graphically using scalar quantities.

B. *Describe the different types of vectors.*

C. *Define a resultant and equilibriant.*

D. *Show with a drawing how a resultant or equilibriant may be found using the vector polygon or parallelogram method.*

E. *Differentiate between coplanar or noncoplanar force systems.*

Simple Dimensioning:

A. *Explain principle of a drawing being "in-scale".*

B. *Demonstrate understanding of fractional, decimal, and metric dimensioning methods.*

C. *Demonstrate common dimensioning techniques as applied to simple parts.*

D. *Prepare a drawing with properly spaced and staggered dimension lines.*

E. *List and identify the various lines and symbols that comprise a dimensioning system.*

F. *Explain the aligned and unidirectional systems of dimensioning.*

Application of Tracing Media, Copiers, and Reproduction Methods:

A. *Describe the common types of papers and films used in industry to make an original drawing.*

B. *Explain the different microforms used in an industrial firm.*

C. *Cite the purposes for photography in a drafting or engineering department.*

D. *Describe the frequently used reproductive copies used by industrial firms.*

E. *Explain the different copying methods employed by drafting departments.*

Model Making:

A. *Explain the use of a prototype.*

B. *Describe the specialized tools, equipment, and materials used in the construction of models.*

Design:

A. *Explain the ingredients used in the design process.*

B. *Describe the sequence of steps used in bringing an idea to creation.*

C. *Explain creativity, brainstorming, research and experimentation.*

Advanced Dimensioning:

A. *Explain the lines, symbols, and notes used in describing the size of an object.*

B. *Demonstrate the ability to locate and dimension special features such as hole patterns, keyways, counterbores, countersinks, spotfaces, chamfers, and threaded holes.*

C. *Demonstrate the proper use of surface quality symbols (finish marks) as applied to surfaces on engineering drawings.*

D. *Describe base line, coordinate and datum plane, and true positioning systems of dimensioning.*

E. *Demonstrate proficiency in the use of dual and metric dimensioning techniques.*

F. *List and explain the essential parts of a tolerance system.*

G. *List and explain the basic hole and basic shaft system of limit dimensioning.*

H. *Differentiate between the various ways of expressing a tolerance.*

I. *Define and explain the term "allowance" and how obtained.*

J. *Apply tolerance to various machine parts using reference tables.*

K. *List and describe the standard classes of machine fits.*

Industrial Drafting - Shop Processes:

A. *Describe the common shop terms and processes found on most working drawings.*

B. *Interpret notes and specifications found on most engineering drawings.*

Threaded Fasteners:

A. *Describe a helix and how it is generated.*

B. *Identify common screw-thread forms and their uses.*

C. *Describe the components of screw-thread.*

D. *Draw selected internal and external screw-threads using the detailed or semi-conventional method of representation.*

E. *Recognize common fasteners and their uses.*

F. *Draw selected internal and external thread symbols using the schematic and simplified methods of representation.*

G. *Explain thread notes and class of fits.*

H. *Draw standard bolts and nuts as found on working drawings.*

I. *Explain thread slope, pitch, and multiplicity.*

J. *Secure necessary screw-thread information from appropriate tables.*

K. *Identify specialized fasteners and state their usage.*

Electronic Drafting:

A. *Identify schematic symbols, diagrams, and circuitry.*

B. *Prepare a schematic diagram given the appropriate electrical components and type of circuitry.*

C. *Identify and prepare a block diagram given the appropriate electrical components.*

D. Identify and prepare a pictorial diagram given the appropriate electrical components.

E. Identify and prepare an industrial construction electrical drawing.

F. Identify and prepare a printed circuit given the appropriate electrical components.

G. Identify at least five career opportunities other than drafting in "Electronicity".

Welding:

A. Describe the welding processes used to join materials.

B. Cite the different types of welds used in the welding process.

C. Identify and explain the parts of welding symbol.

D. Identify the commonly used weld symbols.

E. Prepare a welding working drawing for industrial application given the appropriate engineering constraints.

F. Identify at least five career opportunities in welding other than welding drafting.

Wood Furniture/Cabinetry:

A. Describe the types of projections used on working drawings used in furniture industry.

B. Cite the aids available to the draftsman or commercial artist in depicting furniture.

C. Identify the basic cabinet and furniture woods in common use today.

D. Identify all the instrinsic joinery used in wood construction.

E. Identify all the fastening systems used in wood construction.

F. Prepare an exploded working assembly drawing of a wood object complete with specifications and Bill of Materials - given the appropriate information.

G. Identify at least ten career opportunities in wood - other than wood drafting.

Introduction to Problem Solving:

A. *Explain problem solving and its use in the world of work.*

B. *Identify key people industry who are responsible members in the problem solving process.*

C. *Identify different types of resources available to those engaged in problem solving.*

Pipe Drafting:

A. *Describe the different piping systems, pipes, and fittings used in pipe drafting.*

B. *Identify common piping symbols.*

C. *Explain single and double-line delineation as they refer to pipe drafting.*

D. *Prepare a pictorial single-line diagrammatic working drawing of a normal one-story residential house plumbing system complete with specifications, and Bill of Materials.*

E. *Identify at least seven career opportunities in piping, etc., other than pipe drafting.*

Cam Drawing:

A. *Identify common types of cams and followers.*

B. *Describe various types of cam motion.*

C. *Design a displacement diagram.*

D. *Draw a cam profile for disc and cylindrical cams.*

E. *Identify the appropriate elements of a typical cam system.*

Note: Each area should contain a percentage of career idents and proper safety practices.

Mechanical Power Transmission:

A. Identify the machine elements comprising a belt and pulley system and their depiction.

B. Identify the machine elements comprising a chain and sprocket system and their depiction.

C. Identify common types of gears.

D. Explain gear nomenclature.

E. Prepare a working drawing of a spur, rack, bevel, and worm gear.

F. Identify the component parts and their symbols of a hydraulic or pneumatic system.

ARCHITECTURE

Architectural Periods and Styles:

A. Describe characteristics of different periods of architecture.

B. Identify factors that have influenced architecture.

Careers in Architecture:

A. Describe the duties and responsibilities of an architect.

B. Identify several careers that relate to architecture.

C. Cite the educational experiences needed in becoming an architect.

Consumer Protection or Credentialing and Legal or Financial Implications:

A. Explain several consumer safeguards used in building or buying a new home.

B. Cite local, state or federal restrictions imposed on a newly proposed home.

C. Describe the purpose for zoning and building regulations.

D. Describe environmental restrictions imposed on a new home.

E. Explain financing and building costs.

Architectural Planning Function:

A. Describe the use of a plot plan.

B. Explain transit use.

C. Explain the design process as it applies to new materials, conventional, solar, and energy alternates, and methods of building construction.

D. Identify the different areas of a home.

E. Explain applied functional landscaping.

F. Explain survey use.

Architectural Drawing Function:

A. Identify and draw standard architectural symbols.

B. Use the architect's scale properly.

C. Describe and prepare the different types of working drawings needed to construct a building.

D. Explain the different methods used in home construction.

E. Identify the structural members and techniques used in home construction.

F. Describe what is contained on electrical, plumbing, and heating drawings.

G. Prepare a rendering or scaled model of a house.

H. Utilize architectural resources in the design of a home.

I. Prepare sectional drawings, detailed drawings, specifications, and a materials list for a proposed home.

J. Prepare a topographical survey plot plan showing all objects with keyed breakdown - given appropriate information.

PART II

Curriculum Implementation

PART II

Curriculum Implementation

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Curriculum Implementation

Section A - Industrial Drawing

AREA CONTENT	LEVELS:							GOALS --- WORK
	COURSE				GRADE			
	I	II	III	IV	K/6	5/9	9/12	
I The general elementary curriculum in its totality should be enhanced, in effect made more meaningful, by the judicious use of drafting equipment, materials, and processes, NEVER MORE SOPHISTICATED THAN NECESSARY. These curriculum areas would be: A. COMMUNICATION 1. Speaking 2. Reading 3. Writing B. MUSIC/ART 1. Listening perceptively 2. Seeing with understanding 3. Proportions/Colors C. OBJECTIVE THINKING (CRITICAL) 1. Arithmetic/Number skills 2. Objective evaluation 3. Planning The applied (A, B, C) activities would center in planning, drawing increasingly "drafting-ized", and elementary manuscript lettering for real working directions and list of materials to be used.[1]	X				X			1. He or she can properly FOLLOW DIRECTIONS when posed to class or to individuals. 2. The effective USE OF TIME so as not to waste it. 3. The getting along with one's peers in the learning of the term RESPECT for self and for others = cooperation, built on understanding and tolerance. 4. The assumption of sharing the burden of RESPONSIBILITY in all class activities of shared concern...in effect democracy in action. 5. The proper physical doing of any OPERATIONS, and the end products of such activities as the class and/or such individuals have been involved in. 6. The degree of CRITICAL THINKING he or she is capable in all areas of exposure but particularly in the area of FUNCTIONAL PLANNING prior to doing. 7. A preference for CLEANLINESS as it relates to personal hygiene, working conditions, and the finished product of all this activity. 8. The consistent development of INITIATIVE by his or her willing involvement in projects utilized for class learning, even if project evokes no "love". 9. An objective analysis of any reasonable CONSUMER PRODUCT as to its: composition, design, and service.

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[1] Known as printing at this stage

GENERAL for the WORLDS of :

RECREATION

1. The correlation of shop skills and knowledge of tools, equipment and processes to properly applied recreational use (HOBBY, ETC. USE)
2. Adequacy in correlating any of the HEALTH AND SAFETY practices from shop to worthwhile leisure-time activities.
3. Some positive HOBBY DEVELOPMENT induced by prior class work, *etc.
4. The differences between safe and unsafe TOYS in terms of health and ecology.
5. Same as above for any other RECREATIONAL DEVICES.

LIVING

1. The differences between good and bad DESIGN in consumer products.
2. The differences between good and bad SERVICES derived from consumer products.
3. The differences between good and bad consumer product ASSEMBLY (of parts).
4. The differences between good and bad consumer product MATERIALS AND CONSTRUCTION.
5. The difference between safe and unsafe USAGE of household HAND tools.
6. The difference between safe and unsafe USAGE of home-oriented POWER tools and equipment.
7. The proper use of consumer products: SPECIFICATIONS AND MAINTENANCE table.
8. Reasonable mastery in EVALUATING consumer product(s) as to being good or not good.*
9. The correlation of simple shop skills and knowledge of tools, equipment and processes to properly applied HOME MAINTENANCE AND REPAIR.*
10. The difference between honest, shady, and dishonest product and services ADVERTISING.

RELATED

*3 The study of : Gutenberg leading to block printing; leading to personalized greeting cards.. of Ty Cobb; leading to making a baseball bat; leading to playing baseball.

*8 Can be used in lieu of 1 - 7 in K - 4 grades where reasonable could mean suspect and confirmation made by an adult or older person.

*9 Carpentry, plumbing, electrical, machine, painting-finishing, landscaping, auto, heating, insulation, etc. tools and activities.

Note: The above can also be used for pure recreational uses, in effect, the proper use of:

1. Glues for model making
2. Lump hammer for driving in horseshoe stakes
3. Finishing for staining new table top
4. Open-end wrench for proper bicycle wheel adjustment, etc.

	LEVELS:							GOALS ---
AREA CONTENT	COURSE				GRADE			WORK
	I	II	III	IV	K/6	5/9	9/12	
								10. Discovery of and development of PRIDE IN CRAFTSMANSHIP even when activity is disliked. *11. Increasing awareness of his own innate skill potential whether industrially oriented or not.* *12. The soundness of safe as opposed to unsafe WORKING HABITS (eye safety, clothing, and actions).* *13. The similarities and differences of all the CAREER ACTIVITIES in the immediate school neighborhood and later the total community so that positive thinking and therefore conversation describing them can occur.*

GENERAL for the WORLDS of :

RECREATION	LIVING	RELATED
	11. The mastery of the STOP, LOOK, LISTEN skills when no comparison(s) are immediately possible.	*11. When no prior experiential materials or situations exist to base evaluative judgements on, then, if action is necessary, use XRR Crossing Technique...be careful. *Note: All these performance objectives shall be evaluated by the teacher as to actual behavioral change(s). At this level, it ought to be by: 1. Observations 2. Show and Tell 3. Writing = reverting more to objective written form as aging occurs. 4. Illustrate = illustrated

	LEVELS:							GOALS — — —
AREA CONTENT	COURSE				GRADE			WORK
	I	II	III	IV	K/6	5/9	9/12	
AREAS OF INVOLVEMENT, CONT'D								
II Sketching--noninstrumental (without instruments) Freehand only.	X	X	X	X	X	X	X	*The essential first step to all preplanning graphic solutions should be quickee pictorial sketches of problems and/or quickee orthographic proposed solutions using freehand non instrumental sketching techniques. Therefore* *1. The ability to sketch thoughts, ideas, an designs is the first step in this process* *2. The ability to develop a sense of proportion and accuracy of observation is the second step in this process.* *3. The use of horizontal, vertical, oblique, and circular lines as the media of expression and interpretation must be constantly developed and reinforced.*
III Lettering--noninstrumental (freehand) first and instrumental after this.	X	X	X	X	X	X	X	*To gradually enable the fingers and hand alon to create increasingly more acceptable Alpha and Numeric symbols which will equal and/or surpass acceptable industrial standards, in effect, the development of:* *1. Freehand (noninstrumental) lettering* *2. Instrumental lettering such as .* *a. Template* *b. Devices and LEROY, WRICO, etc.* *c. Straight edge* *3. Instant lettering adhesives*

GENERAL for the WORLDS of :

RECREATION	LIVING	RELATED
Graphic self-expression with drafting overtones so that understanding will result- either three-dimensional or orthographic in nature.	Applied consumer use relative to wiser and more functional daily involvement with research, understanding, purchase, proper use of, maintenance, and repair of any and all items that lend themselves to drafting experiential interpretation, in effect; auto and parts, cutlery, dishes, pans, sinks, counters, ranges, electrical devices, eyeglasses, furniture, garden tools, and so on; being able to read prints and specs as well as Bills of Materials, are vital to consumer economics and mental and emotional well being.	This can be the first step towards technical illustration for those students so inclined. These might be identified and enriched with proper exploration and in-depth experience, in effect; shading, color, air brush, stencil, some fine arts experience, etc. For some this will be their career.
Adequate self-expression in lettering using media such as pencil, ink, color-liquid, and solid, brush, pen, and felt-tips; with erasing materials and use of papers, boards, woods, plastics, metals, glass, cloth, and so on. All this for proper spare time use.	Applied consumer use in all applications; whether labeling jams and jellies, addressing envelopes, taking hasty notes for future interpretation, identifying objects belonging to someone, in effect; license hunting, driving, etc., traveling bags, skis, sleds, tools, cake dishes, brushes, permits, and so on.	This can be the first step towards sign painting for those students so inclined. These might also be identified and enriched with much more exploration and in-depth experience, in effect; pencil, crayon, chalk, charcoal, paints- via brush, spray, felt tip, and considerable school and outside of school work leading to increasing remuneration on a non-class basis.

	LEVELS:							GOALS — — —
	COURSE				GRADE			
AREA CONTENT	I	II	III	IV	K/6	5/9	9/12	WORK
AREAS OF INVOLVEMENT, CONT'D								
IV Spatial Relations via orthographics- utilization of abstractual reasoning through the media of sketching to arrive at orthographic solutions: one, two, three or more views in third-angle projection.	X	X	X	X	X	X	X	*The development of the ability to interpret abstractions and incomplete drawing data (one or two views given- what are the others...?) into formalized instrument drawings of normal industrially-oriented representations used for working drawings whether assembly, detail, or exploded in nature. This shall be via the proven methods of:* *1. Miter* *2. Projection* *3. Cube.* *These in turn shall result in normal third-angle projection views as top, front, side (left or right- first and second position).*

GENERAL for the WORLDS of :

RECREATION

Useful application of orthographic processed to spare-time uses, in effect; solving problems by abstractual reasoning, applied drawing, and finally implemented construction of housing form- the same techniques could be applied to any avocational project be it making or patching a boat, fixing a sled or bike, planning a wedding cake, etc.- in short, simple multiview solutions to posed problems.

LIVING

Functional consumer involvement by being useful to the family, community, clubs, organizations, etc. This, by being a tool to and for appropriate action in the solution of daily-living problems, in effect; windows crank or handle broken or lost- make workable replacement...chair leg broken- turn or fashion replacement.. window muntin broken- make new one... wooden knife handle burned- refashion new one to match existing set....the need or desire for new furnishings whether additional rooms, a new house, built-ins, etc ...good abstractual reasoning, proper drawing and implementation via making of object can result in considerable consumer savings and far more enjoyment of daily living.

RELATED

A. This process of reasoning, planning, and drawing should be a gradual evolutionary one for the low grades and early years until critical thinking begins; grades 4 - 5 or 6.

B. The full scope of drafting-oriented careers should be presented at this point in time... especially in the elementary experience, in effect; detailers, designers, chief draftsmen, checkers, tracers, junior engineers, in the areas of:

1. Aero-space
2. Architecture
3. Electrical
4. Graphic Arts
5. Industrial Design
6. Mechanical
7. Patents
8. Piping
9. Production and Technical Illustration
10. Structural
11. Teaching
12. Topographics

AREA CONTENT	LEVELS:							GOALS --- WORK
	COURSE				GRADE			
	I	II	III	IV	K/6	5/9	9/12	
V Tools- Kindergarten								
A. Pencils; black and color					K			A. Reinforcement of individual's ability to work cooperatively.
B. Crayons								B. Identification and use of materials and tools.
C. Paper; assorted sizes and colors								
D. Eraser								
E. Rulers (metal edge)								
F. Working Surface (desk top or portable 1/8 masonite sheet 12 x 16)								
G. Brush (dust)								
H. Sharpener (pencil and wall)								
I. Scissors								
J. Paste, Glue, and Cement								
K. Tape								
L. String								
M. Cloth								
N. Flannel Board								

AREA CONTENT	LEVELS: COURSE I	II	III	IV	GRADE K/6	5/9	9/12	WORK
All of Kindergarten plus:					1,2			
A. Desk								
B. Chair								
C. Sink (water- hot and cold, towel dispenser)								
D. Soap and Cleaner								
E. Chalkboard and Eraser								
F. Storage Cabinets								
G. Counter Space								
H. Cardboard Patterns/Templates								
I. Paper Cutter								
J. Simple Graph Paper, 1/2 inch								
K. Sandpaper								

AREA CONTENT	LEVELS: COURSE I	II	III	IV	GRADE K/6	5/9	9/12	GOALS --- WORK
All of K - 2 plus:					3,4			A, and B from the preceding page, plus:
A. Ball Point Pens								C. Critical evaluation of tools.
B. Printed Matter (teacher-made)								D. Role playing jobs in an adult work world, in effect; career sampling
C. Water Colors								
D. Pencil Compass								
E. Compass and Bow Compass, Compass and Straitedge, Compass and Triangle								
F. Lettering Stencils								
G. Felt Pens								
H. Onionskin Paper								
I. Metal Tape								
J. Carpenter's Rule (zigzag)								
K. Paper Punch								
L. Fastening Devices (paper)								
All of K - 4 plus:					5,6			E. Critical evaluation of tools and processe
A. Elementary Tool Panel for Open Classroom use								
B. Drawing Paper and 1/4 inch Graph Paper								
C. Books; Individual and Reference								

GENERAL for the WORLDS of :

RECREATION	LIVING	RELATED
Elementary planning in the construction of seasonal decorations.	*Personal care regarding ownership of tools.* *Elementary maintenance, repair, and upkeep of tools*	
Hobby beginning.	*Beginning of consumer knowledge and informed purchasing.*	*Start of individual appreciation of industrial complex.* *Note: Possibility of inclusion of drafting objectives within these areas.*

	LEVELS:							GOALS ---
AREA CONTENT	COURSE				GRADE			WORK
	I	II	III	IV	K/6	5/9	9/12	
Continued from page 12;								
D. Paper Cutter					5,6			A, B, C, D, and E plus:
E. Elementary-Correlated Work- Plan Book								
F. Protractor- L's								
G. Lead Pointer								
H. Group Work Area (within classroom)								
I. Individual Drafting Board Usage								
J. Small Drawing Paper								
K. Small Area Complement								
All of K - 6 plus:						7,9		F. Introduction to the fundamental tools of drafting, sequentially arrived at.
A. Drawing Tables								
B. Drawing Boards								
C. Drawing Paper								
D. Graph Paper								
E. Storage Cabinets								
F. Drawing Pencils								
G. Drawing Erasers								
H. T-Square								
I. Triangles, 8 inch preferred								

GENERAL for the WORLDS of :

RECREATION	LIVING	RELATED
		Correlation with existing grade curriculum. Greater emphasis on individual and his exploration of beginning drafting areas related to his new-found abilities and likes.
Proper use and fundamental processes in exploration for personal applied use (pleasure--application)	Planning phase used in relation to youthful earning potential--for example; 1. Making a map for a paper route, charts to indicate profit, loss, expenses.	Applied general drawing. Greater directional emphasis (of the above)

AREA CONTENT	LEVELS:							GOALS --- WORK
	COURSE				GRADE			
	I	II	III	IV	K/6	5/9	9/12	
All of K - 8 plus: A. Individual Storage Areas B. Class File Cabinet C. Reproduction Machine D. Reproduction Paper E. Tracing Paper/Vellum F. Teacher Drafting Table/Board G. Quill Lettering Pens H. Erasing Shield I. Beam Compass J. Scale Guard K. Erasing Powder L. Adjustable Protractor M. Small Bench Vise N. Large Bow Compass, 7 inch O. Small Bow Compass, 3 inch P. Chalkboard, T-Square, Compass, Protractors, and Triangles							9	G. Appreciation of proper use of tools as related to the functions of the industri language. Also inclusded are A, B, C, D, E, and F of the preceding page.

GENERAL for the WORLDS of :

RECREATION	LIVING	RELATED
Personal use and proper application for applied needs.	Ability to read schematics; blueprints, graphs, sketches, bill of materials, specifications, charts, in effect; in purchase, assembly, maintenance, and repair of bike, air rifle, dress pattern, etc.	General drafting. Emphasis on broad general coverage of total field of drafting--no real skills demanded here.

	LEVELS:							GOALS ---
AREA CONTENT	COURSE				GRADE			WORK
	I	II	III	IV	K/6	5/9	9/12	
All of K - 9 plus:							10	
A. Individual Student Equipment Sets:								A, B, C, D, E, F, and G of the preceeding page. More individual intensification applied.
1. Bow Compass								
2. Dividers								
3. Ruling Pen								
4. Repair Kit								
B. Index Paper, Colored								
C. Colored Inks								
D. Civil Engineers Scale								
E. Mechanical Engineers Scale								
F. Tracing Powder								
G. Ames Lettering Device								
H. Braddock-Rowe Triangle								
I. Technical Fountain Pen								
J. Oil Stone								
K. Steel Wool (fine)								
L. Chalkboard, and Drafting Machine								

GENERAL for the WORLDS of :		19
RECREATION	LIVING	RELATED
		Architecture I, Drafting I and II at teacher's discretion- orientation **Note:** Supplementary tool list relative to Architecture.

AREA CONTENT	LEVELS:							GOALS ---
	COURSE				GRADE			WORK
	I	II	III	IV	K/6	5/9	9/12	
All of K - 10 plus:							11, 12	
A. Mylar								Individualized instruction.
B. Cloth								
C. Pantagraph								
D. Proportional Dividers								
E. Desk Drafting Machine								
F. Computer Access								
G. Computer Plotter (Hardware and Software essential to graphic expression)								
H. Curves; Ship and Railroad								
I. Flexible Curve								
J. Drop Bow Compass								
K. Quick Set Compass								
L. Assorted Templates								
M. Polar Planimeter								
N. Reader/Printer								
O. Copy Stand and 35 mm Camera								

AREA CONTENT	LEVELS: COURSE				GRADE		
	I	II	III	IV	K/6	5/9	9/12
Areas of involvement, continued-							
VI DATA PRESENTATION							
A. GRAPHS							
1. Bar	X				X	X	X
2. Line	X				X	X	X
3. Circle (pie)	X				X	X	X
4. Pictogram (graph)	X					X	X
5. Histogram (Bell Curve)	X					X	X
6. Pictorial/Relief	X	X				X	X
B. CHARTS							
1. Time	X				X	X	X
2. Rectilinear	X						X
3. Semilogarithmic		X	X				X
4. Logarithmic		X	X				X
5. Coordinate		X	X			X	X
6. Barographs	X	X				X	X
7. Polar		X					X
8. Trilinear				X			X
9. Alignment (NOMA)				X			X
10. Flow	X					X	X
11. Operations	X					X	X
12. Organization (Progression)	X					X	X
C. DIAGRAMS							
1. Motion	X				X	X	X
2. Process	X				X	X	X
3. Analysis	X				X	X	X
4. Operative	X				X	X	X
5. Identification	X				X	X	X

GOALS --- WORK

The development of the ability to critically analyze and linearly present data, statistically or otherwise, clearly and precisely by leading the viewer(s) through immediate impressions to speedy interpretations and understanding.

This must be done by making meanings vivid and thorough and by clarifying relationships and by focusing attention on particular facts and/or meanings. This, by utilizing the best or most likely methods and devices, be they F- 1, 2, 3, or 4, bring out the meaning and intent of the data.

The methods and techniques should be adaptable to all phases of society be they business, industrial, civil, military, religious, etc. Therefore, important are such items as:

1. *Critical thinking*
2. *Data comprehension*
3. *Methods variability*
4. *Technique adaptability*
5. *Technique application*
6. *Time*
7. *Neatness*
8. *Accuracy*
9. *Legibility*
10. *Speed*

GENERAL in the WORLDS of :

RECREATION	LIVING	RELATED
Personal applied use in whatever areas of leisure-time commitment soley for purposes of self-involvement, in effect; pleasure, hobbies, services to others, etc.	*To be able to functionally utilize the data presentation form(s) for self expression as well as understanding "its" message, whatever its origin or purpose, in effect; industry, business, government, education, etc.* *Enlightened consumer knowledge could certainly utilize this methodology for:* *1. Keeping records* *2. Plotting progress (±)* *3. Solving problems* *4. Providing direction, for example; best route to Aunt Nellie's summer house.*	*Early career identification of future statisticians, cartographers, research analysts, artists, and drafters can be observed and nurtured.* *Not all the areas within the four units would be applicable to complete involvement. Often vicarious involvement would be the better means of research where the nature of the materials and methods are beyond the present realm of student experiences.* *Certainly, however; each of the 1 - 4 unit subdivisions should be presented for complete exposure and the possible awakening of above noted personal expertise inclinations leading to greater exploration and deeper experiences for career related activities...especially their early identification.*

AREA CONTENT	LEVELS: COURSE				GRADE			GOALS --- WORK
	I	II	III	IV	K/6	5/9	9/2	
VI DATA PRESENTATION, concluded-								
D. MAPS/CARTOGRAPHY								
1. Profile			X	X			X	
2. Land Survey (flat)			X	X			X	
3. Topographic			X	X			X	
4. Contour			X	X			X	
5. Hydrographic			X	X			X	
6. Cadastral			X	X			X	
7. Military			X	X			X	
8. Aeronautical			X	X			X	
9. Navigation			X	X			X	
10. Engineering			X	X			X	
11. Landscape			X	X			X	
12. City	X	X	X	X	X	X	X	
13. Highway	X	X	X	X	X	X	X	
14. Structure			X	X			X	
15. Geodetic (state, nation, continent, etc.)	X	X	X	X	X	X	X	

GENERAL for the WORLDS of :		24
RECREATION	LIVING	RELATED
		The proper use of maps, their interpretation and frequent free-hand reproduction would greatly smooth the way for adult users of autos, boats, planes, and their usage for travel.
Usable for camping out...summer or winter retreat, housing and land belonging thereto and its utilization.	Determining home land ownership, its boundaries and best legal utilization relative to well water, septic system, tree encrouchment, wind and snow barriers, additional structures, etc.	
Usable for learning to fly and subsequent soloing. The same for boating, licensing, and subsequent sailing.	Only if piloting a plane is essential to livlihood - same as above relative to skippering a boat.	
Gardening layout enhancing area around house.	Functional use of such plans - their interpretation and understanding...consumer usage.	
Usable when planning trips...best routes, safest ways into and out of cities... pleasure driving, visiting museums, seeing shows, athletic events, etc.	Same as above for "daily" essential use of highways relative to job requirements ...includes some enlightened information concerning cities, states, and national traveling routes and means of getting railroads, etc.	

AREA CONTENT	LEVELS:						
	COURSE				GRADE		
	I	II	III	IV	K/6	5/9	9/12
VII SECTIONS							X
A. FULL	X	X	X	X			X
B. OFFSET	X	X	X	X			X
C. HALF	X	X	X	X			X
D. BROKEN-OUT	X	X	X	X			X
E. REVOLVED	X	X	X	X			X
F. REMOVED	X	X	X	X			X
G. OUTLINE	X	X	X	X			X
H. BLACKED-IN	X	X	X	X			X
I. PHANTOM	X	X	X	X			X
J. SHADED-IN	X	X	X	X			X
K. ADAPTATION re PARTIAL (FULL, HALF)	X	X	X	X			X
L. ALIGNED	X	X	X	X			X
M. CONVENTIONAL BREAKS		X	X	X			X

GOALS --- WORK

The development of the ability to clearly and precisely depict such internal details of an object as will best clarify and directly show the true nature of its inner "parts". That is, the accurate intersection of "internal"[1] planes: horizontal, vertical, angular, cylindrical, or spherical. This, by removing selected portions of the exterior, usually via cutting planes so as to transform the normal hidden lines into object lines and the cut or broken-off elements into standardized symbolism(s) depicting specific material composition(s). This knowledge and ability is vitally essential for detail and assembly drawing and work.

For sectionals the following items must be understood and functionally applicable:

1. *Cutting Planes*
2. *Arrow Heads for Cutting Plane*
3. *Cross Hatching or Section Lining*
4. *Aligning Procedure*
5. *Techniques of Partials*
6. *Technique for Conventional Breaks*
7. *Pencil Usage- Controls of*
8. *Internal Spatials*
9. *Referencing*
10. *Inking Expertise*
11. *Rub-On Material Symbols*

[1] *"Internal" here signifies anything beyond the surface skin, in effect; below it...near the middle or on the very bottom of the unit viewed as from the top.*

GENERAL for the WORLDS of :

RECREATION	LIVING	RELATED
Self-applied use relative to avocational needs or desires...anything that requires planning, building and/or fixing for pure self-entertainment or mutual need for fun use... for example, explaining the composition of an apple to little children, or what a house wall is made of, etc. This, by way of filling leisure time meaningfully..	*To be able to intercommunicate as a knowledgeable consumer relative to consumer needs... in effect; the ability to read and understand specification sheets, blue or white prints, detail and assembly drawings of any purchased item or potential purchase for the home...the enlightened consumer should be the end product. Certainly, if the consumer has access to the above mentioned specs and drawings he or she can be influenced in the purchase or nonpurchase of a desired item. If, on the other hand, it requires maintenance and/or repair sectional details will assure his superior understanding of how to do it. This applies to such items as:* *1. Kitchen Devices* *2. Laundry Devices* *3. Landscape Devices* *4. Plumbing Devices* *5. Heating Devices* *6. Cooling Devices* *7. Transportation Devices* *8. Tools, Materials, and other kinds of Equipment of all kinds, etc.- Clothing and Footwear included*	*Sectional detail and assembly drawing should not be the exclusive domain of industry, the engineer, the drafter, etc. They can also be used in bakery, dress shop, tailor shop home sewing center...for instance, to define the interior of fruits, vegetables, berries, layer cakes, bread, pizzas, hard eggs, prepared meats, clothing ensembles, etc. Any one of the thirteen sections could graphically describe any of the above small sampling related to the home...etc.*

AREA CONTENT	LEVELS: COURSE I	II	III	IV	GRADE K/6	5/9	9/12
VIII PICTORIALS							
A. AXONOMETRIC							
1. Isometric	X	X	X	X		X	X
2. Dimetric		X	X	X			X
3. Trimetric		X	X	X			X
B. OBLIQUE							
1. Cavalier	X	X	X	X		X	X
2. Cabinet	X	X	X	X		X	X
3. General	X	X	X	X			X
C. PERSPECTIVE							
1. One Point		X					X
2. Two Point			X				X
3. Three Point			X				X
4. Four Point[1]				X			X

GOALS — — —

WORK

To be able to satisfactorily define any drawable object in three-dimensional drafting terms...a top or bottom plus the two end pieces (sides) simultaneously, in effect; three faces in single object form.

This type of drafting although giving the appearance of free-flow, with the exception of perspective, is really very rigidly scaled and tool developed. Both axonometric and oblique are generally reserved for the following activity areas:

1. *Design*
2. *Installation*
3. *Maintenance*
4. *Repair*

A further breakdown in terms of applied use is:

1. *Problem Solving Sketching*
2. *Assemblies, Regular and exploded*
3. *Detailing*
4. *Sectioning*
5. *One and Two-Line Piping (Diagramatics/ Schematics)*
6. *Charting, Graphing, and Mapping*

---

[1] *Mech, arch, aero, nautical, auto, electrical, etc.*

RECREATION

To be able to utilize any of the pictorials for avocational purposes, recreation or the sheer joy of achievement, in effect; drawing of lean-to for shelter after all-day hike, so that it can be built...understandding of directions in assembling of boat re exploded iso-assembly drawing...facility to accurately define broken part of outboard engine in cavalier working drawing so that a replacement was immediate...the experience of gained knowledge and technique in applied form to produce a beautiful reproduction of that orange sunset across the distant hills as autumn plied its marvel of color, or that perfect reproduction of the gothic cathedral with its spire and its masterfully created arches, flies, and buttresses, etc.

LIVING

Similar to recreational uses but more immediately applicable to the daily-life needs of the knowledgeable consumer. This, in his or her adaptation of the pictorial drafting forms and techniques to normal everyday living problems such as; sketching and designing new kitchen cabinets so that the spouse could understand and approve prior to construction...the same for furniture in the house or the creation of new toys or a doll house, also, identifying and defining pictorially the damaged utility-fixture control so that an accurate purchase or machined replacement could be obtained.

This kind of activity as well as being able to perceptively understand and interpret technical sales specifications and detail and assembly drawings relative to prior purchase intent of house addition pre-fab kit...or window kit, or door knock-down, etc.

These, and a continuous multitude of similar satisfactorily solved daily-living problems lead to the best in the applied articulation of enlightened consumerism, etc.

RELATED

For a better-informed work force and society, it is necessary to depict things three-dimensionally, closely aligned to photography, yet which is numerically defined via precise formula application. Therefore, varying forms of pictorial drawing are utilized. Each is better used in some places than in others.

Generally, when scaling, the axonometrics, with the accent on isometrics are used more frequently than the obliques; although the latter are actually easier to draw.

Perspective, is applicable almost anywhere at anytime.

Career identification in the pictorial area can readily be accomplished by enhancing experiences via individual study and assignment for such areas as:

1. Technical Illustration
2. Architectural Renditioning
3. Industrial Design
4. Cabinetry Contracting
5. Furniture Design
6. Interior Decorating
7. Landscaping

	LEVELS:							GOALS – – –
AREA CONTENT	COURSE				GRADE			WORK
	I	II	III	IV	K/6	5/9	9/12	
								These elements as well as perspectives, are applicable to the ***total*** *drafting language in any and all of its component disciplines.*[1] *The specifics of developing each of the three types of pictorials depends on a precise working knowledge and applicability of the following specifics:* *1. Axes of Presentation* *2. Axes of Projection* *3. Axial Measurements* *4. Angular and Linear Ratios* *5. Nonaxial Lines* *6. Axially interpreted angles* *7. Irregular curves* *8. Offsetting (Axial Coordinates)* *9. Axial Circles and Curves* *10. Axial Aligned Dimensioning* *11. Theory of Vanishing Points* *12. Establishing STA, GRD L'N and V Points*

GENERAL for the WORLDS of : 29A

RECREATION	LIVING	RELATED
121		122

AREA CONTENT	LEVELS: COURSE I	II	III	IV	GRADE K/6	5/9	9/12	GOALS --- WORK
IX AUXILIARIES								To be able to accurately depict object elements which in regular projection appear distorted. These are:
A. PRIMARY		x	x	x			x	1. True Length of Line
B. SECONDARY		x	x	x			x	2. Point View of Line 3. Edge View of Line
C. SUCESSIVE		x	x	x			x	4. True Size of Plane (Configuration
								Most commonly, angles and offset circles (ellipses) comprise functional drafting-proble materials.
X REVOLUTIONS								
A. COUNTER		x	x	x			x	Two methods in solving the above are to revolve the viewer plane parallel to the angular problem to be solved. The other is to revolve the angular problem area into the viewers normal plane of view. This is the revolution method.
B. SUCCESSIVE		x	x	x			x	In addition to properly revolving the problem area and correctly applying measurements to reference or datum planes, the revolved objects and the planes applications must be correctly adapted to front, center or rear. The ability to depict the following revolution and auxiliary techniques should be mastered: height, width, and depth auxiliaries, successive auxiliaries and revolutions. Also, auxiliary and revolution: circles, plotted curves, reverse construction, primary, secondary, partials, sections, and obliques. Note: Precision in divider, compass and measuring work is vital.

GENERAL for the WORLDS of :

RECREATION	LIVING	RELATED
To be able to use any of the auxiliary and/or revolution techniques in the resolution of hobby/activity-centered problems, in effect; roofing for outdoor structures, tent, rigid, square or differingly geometric in shape such as truncation in cones, or parabolics, or hyperbolics, etc. *These, to be covered with new roofing when direct measurement and layout is impossible. The correct size and shape of new vinyl to repair the weakened but still good and underwater diving pit truncation-determining true size, shape, and angle of glider kite surfacing material, etc.*	*To be able to use any of the auxiliary and/or revolution techniques in solving home centered daily living problems.* *For example, if the roof is high and no ladder is available the drawing of the roof section can be utilized as a base for true size and shape resolution... hence, area, and the resultant number of bundles of roof shingles.* *Also, to determine size and shape of valley flashing and chimney cricket via drawing from plates of house- not by direct measuring. The same, also, can be done in solving for cathedral ceiling area, paneling or covering with paper or cloth, etc.*	*This area of drafting can and should be directly integrated with descriptive geometry in the late junior or senior years-- excellent training area for the mentally agile.* *This combination in experiential form can lead to as complete an understanding and use of spatial functions as can presently be devised. Excellent experience for future engineers, architects, engineering trouble-shooters, etc.*

AREA CONTENT	LEVELS: COURSE I	II	III	IV	GRADE K/6	5/9	9/12
XI DEVELOPMENTS		X	X	X			X
A. PARALLEL LINE							
B. RADIAL LINE							
C. TRIANGULATION							
XII. INTERSECTIONS		X	X	X			X
A. STRAIGHT							
B. CURVED							
C. OBLIQUE							

GOALS --- WORK

The development of the ability to correctly and accurately plan and layout any shaped object which is peripheral, in effect; as a skin of whatever material, to cover and contain, in whole or in part, that within. Such items could be boxes, cartons, funnels, ducting, pants legs, lampshield, etc. Patterns or stretch-outs are other names for such drawing results.

Extremely close tolerancing is not usually essential for normal parallel and radial line work, but tolerancing [illegible] required for the triangulation and intersection processes.

The ability to depict the following should be well learned:

1. Prismatics
2. Cylindricals
3. Pyramidals
4. Conicals
5. Frustums
6. Truncations
7. True Radial Line Lengths
8. Elbows
9. Seams
10. Triangulations
11. Obliques, joining of geometric paradoxes
12. Intersection of; rectangular and oblique, also prisms and pyramids, cones and cylinders, and the development of such intersections

The development of consistantly fine measuring, divider, pencil, and scriber work must be stressed.

GENERAL for the WORLDS of :

RECREATION

Again, the utilization of this kind of drafting for hobby activities should be stressed. For example, the planning, designing, and actual making of the hood air scoop for the dragster...or the same for home refills, or the large kerosene carrier can, or the large picnic bags, or the dunce cap for the party, or the patterns for and the dolls clothes, etc.

LIVING

The truly enlightened consumer should utilize these techniques for regular daily-living problem solving for things such as; patterns for sewing, new clothing, installation of climate control system, making new furnace plenum chamber, repairing car muffler, determining chimney cricket flashing, making new home needed pails, pots-coffee and cooking, and so on. Indeed, one should be mindfull that better and more intelligent buying should result for such items as pails, pots, cans, clothing, containers, etc.

RELATED

This area of drafting, like auxiliaries and revolutions, should also be integrated with descriptive geometry on the upper grade levels, this too, will do wonders for enhancing spatial relations to generate true critical thinking- solutions that come abstractually.

Early career identification can be made by close observation of student activities, in effect;

1. Plumbers
2. Sheet Metalists
3. Metallurgists
4. Fashion Designers
5. Tailors
6. Packaging Experts
7. Tinsmiths
8. Environmentalists
9. Research Analysts
10. Plastics Engineers, etc.

AREA CONTENT	LEVELS: COURSE I	II	III	IV	GRADE K/6	5/9	9/12
Areas of Involvement, Continued;							
XIII APPLIED MECHANICS OR VECTOR GEOMETRY							
A. SCALAR			X	X			X
B. COPLANAR			X	X			X
C. NONCOPLANAR			X	X			X
D. CONCURRENT			X	X			X
E. NONCONCURRENT			X	X			X
F. PARALLEL			X	X			X
G. COLLINEAR			X	X			X

GOALS --- WORK

A thorough knowledge or applied mechanics or vector geometry is essential in the world of work. This, especially in applied design, whether engineering, architecture, or structural.

Since drafting deals primarily with graphic solutions, the same tack should be taken in measuring pressure or force and its resultant effect(s) on other items whether in motion, or idle during a given time span, either singly or in multiple application(s), for example, studying wind or snow load on a roof, or live and dead loads on a given timber required to span a given distance, or the live and dead load a bridge must successfully support, or other applications to pulleys, wheels, levers, couplings, etc.

Since math equations are both complicated and laborious in use, the graphic-vector-analysis method is simple, direct, and far more beneficial in the visualization and analysis of problems. Thus, the following are listed as items to master in the applied use of vectors:

1. *Knowledge of Composition of and Resolution of Forces*
    - a. *Triangle of forces method*
    - b. *Parallelogram of forces method*
    - c. *Polygon of forces method*
    - d. *Complying (one-directional) forces method*
    - e. *Opposing (two-directional) forces method*
    - f. *Parallel forces method*
    - g. *Moment of force method*

GENERAL for the WORLDS of :

RECREATION

A knowledge concerning vector geometry analysis is very helpful for those especially charged with the responsibility for the safety and success of leisure-time activities affecting others...the parent, most experienced, etc...for example, dealing with the application of Newton's Laws of Motion in some form, in effect; the use of the correct pulley ratios will quickly and efficiently transport supplies and camping equipment up a sheer cliff to a plateau site, rather than lugging them the long way around via underbrush, swamp, and precarious rock projections-many miles.

Similarly, the correct combination of block and tackle plus line can easily move boulders, tree trunks, stalled vehicles, old camp structure debris, etc. Also, determining what the resultant for applied force must be in safely pushing or pulling something up an incline can either result in successfully applied physical body-power then and there or waiting until the proper pulleys and lines have arrived. The alternative of no luck plus injured backs should not even be entertained!

In another vein, determine what type and size of lumber must be used, from the existing trees for the repairs on the scout mess hall roof re existing but useless roof beam or floor girder or installation of a new bridge for access to the newly diverted water supply across the ravine, etc... proper planning, correct figures, no accidents, etc.

LIVING.

The ability to utilize vector analysis methods for properly applied daily-life situations is desirable. Thus, the application of this kind of paper problem solving to, for example, house design correction for assuring correct structural dimensions and materials for the amount of permissable joist protrusion for the desired living/dining room wall, etc. Cantelever repairs or new installation...similar solutions, resultants, could be obtained for the new addition trussed roof design, re span, height, pitch, load, and lumber size, as well as the snow and wind loads it must successfully hold...likewise, the building of a new bridge, across the stream to the balance of the owners property, could be properly planned before construction... this time upon raised supports so that flood waters will not again disturb it.

RELATED

The early discovery of career potentials could be enhanced here in the following areas:

1. Structural design engineering
2. Structural assembling
3. Structural quality control inspection
4. Welding
5. Riveting
6. Labor management
7. Metallurgy
8. Science research, general
9. Physics related activity
10. Chemistry related activity
11. Mathematics related activity
12. Computer related activity
13. Industrial applied mechanics
14. Architecture
15. Military
16. Contracting/Building, etc.

AREA CONTENT	LEVELS:							GOALS --- WORK
	COURSE				GRADE			
	I	II	III	IV	K/6	5/9	9/12	
								2. Composition of Force Elements a. Direction b. Place of application c. Magnitude d. Sense e. Resultant
XIV DIMENSIONING SYSTEMS A. ALIGNED B. UNIDIRECTIONAL C. METHODS 1. In-line 2. Profile	X						X	Communication of actual size values re: geometric breakdown of products to be defined for purposes of identification and/or production.

GENERAL for the WORLDS of :

RECREATION	LIVING	RELATED
Preface- same as any kind of planning using graphic measuring for enjoyment and/or satisfaction in making: *1. Toys* *2. Games* *3. Doll House* *4. Go-cart* *5. Soap box racer* *6. Clothes* *7. Dolls, etc.*	*Preface- same as instruction for repair and maintenance re: to reproduction of necessary house-related items:* *1. Shingle replacement* *2. New bookshelf* *3. Paneling* *4. Cookie cutter* *5. Landscaping projects, etc.*	*Accurate measuring re: directions to minimize waste in purchasing and/or use of material.* *Solve work on paper before finished product is attempted.* *Stock Chasers* *Tracers* *Reproduction Operators* *Sketchers* *Technical Illustrators* *Detailers* *Checkers* *Quality Controllers* *Design Drafters (Designers)* *Project Managers*

AREA CONTENT	LEVELS: COURSE I	II	III	IV	GRADE K/6	5/9	9/12	GOALS --- WORK
XV APPLICATION OF TRACING MEDIA	X	X	X	X			X	To utilize the industrial approach via translucent and opaque originals.
A. TISSUE, VELLUM, MYLAR, CLOTH						X	X	
B. PENCIL	X						X	
C. INK	X	X	X	X			X	
D. MICROFILM								
E. MICROFICHE								
F. APERTURE CARDS								
Note: Possible to include "Photography" within this area (35mm - 110mm)								

GENERAL for the WORLDS of :

RECREATION	LIVING	RELATED
Individual applied use re: personal satisfaction such as; service to others, clubs, individuals (not merely hobbies)	*Making of clothing patterns, duplicating recipes, use of prior media for everyday needs, etc.* *Revision of house, addition, greeting cards, maps, and explanatory usage.*	*Leads to careers dealing with reproduction and duplication of media* *-Overhead* *-Slides* *-Opaques* *-Film* *-Documentaries*

	LEVELS:							GOALS ---
AREA CONTENT	COURSE				GRADE			WORK
	I	II	III	IV	K/6	5/9	9/12	
XVI COPIERS	X						X	
A. DITTO (SPIRIT)	X							
B. MIMEO (INK)								
C. THERMAL (HEAT)								
1. Xerox								
2. 3-M								
3. Thermofax								
D. CHEMICAL								
1. Technifax								
2. Photo-copier								
XVII REPRODUCTION METHODS	X						X	
A. BLUEPRINTING								
B. WHITE PRINTING								
C. SEPIA PRINTING								
D. PHOTOGRAPHY								
1. Microfilm		X	X	X				
2. Microfiche								
3. Aperture Cards								

GENERAL for the WORLDS of :		41
RECREATION	LIVING	RELATED

	LEVELS:							GOALS ---
AREA CONTENT	COURSE				GRADE			WORK
	I	II	III	IV	K/6	5/9	9/12	
XVIII MODEL MAKING	X	X	X	X	X	X	X	1. To utilize proper techniques (safety, proper tools, materials, equipment for end results)
A. HOUSES								2. Gaining of familiarity with general shop tools, mats, and equipment and their safe uses.
B. CARS								
C. BOATS								3. Vocational experiences can be built-in, in effect; industrial designer, mechanical engineer, etc.
D. BRIDGES								
								4. Prototypes

GENERAL for the WORLDS of :

RECREATION	LIVING	RELATED
Used for model building per se, in effect; any item- doll house, ship, soldiers, statues, cars, miniaturizations, train layouts, slot-car racing, etc.	Proper making of sheds, dog house, storage building, bird shelters, feeders... the learning of designing structural requirements building skills gained from model making as applied to daily consumer needs. Use of doll house to develop interior decorating appreciation.	Note: House models to be correlated with residential as should other units. All units to include tool definition to material for instructor reference.

	LEVELS:							GOALS ---
AREA CONTENT	COURSE				GRADE			WORK
	I	II	III	IV	K/6	5/9	9/12	
IXX DESIGN	*X*						*X*	*Introduction to concepts of design and their implication as they relate to:*
A. PACKAGING								*1. Esthetic appeal (Packaging)*
1. Lines								*2. Mechanics of packaging re: Transporation*
2. Shape								
3. Color								
4. Letters								
B. TOTAL DRAWING APPLICATION (Form and function "in application it is function which is primary- form merely follows".)								
1. Function								
2. Operation								
3. Esthetics								
4. Saleability								
C. CONCEPTS								
1. Attract Attention								
2. Retain								
3. Deliver Message								
4. Result in Favorable Action								

GENERAL for the WORLDS of :

RECREATION	LIVING	RELATED
Use of industrial design concepts for personal satisfaction (projects...re: problem solving, in effect; decorating a birthday cake, shapes of cookies, gift packages)	Application of industrial design concepts to daily life...in effect; wardrobe design, choice of materials, color combinations, proportion. Make meaningful personal analyses and evaluations of esthetics vs function, in effect; shoewear, clothing, furniture, transportation,and other concepts leading to a knowledgeable consumer	Good design qualities: 1. Attract attention 2. Retain attention 3. Deliver message 4. Functional

AREA CONTENT	LEVELS: COURSE I	II	III	IV	GRADE K/6	5/9	9/12	GOALS --- WORK
Areas of Involvement[1] *XX ADVANCED DIMENSIONING: The utilization of those rules for numerically defining those geometric characteristics of parts which will clearly describe the engineering intent.*								*To knowledgeably depict in standardized (ANSI) drafting language form all items pertaining to dimensioning and tolerancing as specified by American National Standard Engineering Drawing and Related Documentation Practices "Dimensioning and Tolerancing", ANSI Y14.5, 1973.*
A. NOTATIONS		X	X	X			X	*This means mastery and use of the accepted standards manual for the industry, public, private sector, and the Department of Defense, (DOD)...Army, Navy, Airforce, also DSA, DSAH, SCT, NSA.*
B. A.N.S.I. REFERENCING (STANDARDS)		X	X	X			X	
C. GAUGING REFERENCING TYPES		X	X	X			X	
D. FUNDAMENTAL RULES FOR DIMENSIONING		X	X	X			X	
E. UNITS OF MEASUREMENT: *1. U.S. Linear (Decimal inch and/or fractional, decimal preferred)* *2. S.I. Metric (mm)* *3. Identifying Notation* *4. Dual Linear...Fractional, In-Line, Bracket, Combinations thereof* *5. Angular* *6. Undimensioned*		X	X	X			X	
F. APPLICATION OF DIMENSIONING...FEATURE AND LOCATION: *1. Reference* *2. Location* *3. Size* *4. Overall* *5. Aligned (In-Line, Chain)* *6. Contour (Profile)* *7. Spacing of* *8. Placement of* *9. Extension Lines...Perpendicular, Oblique, Crossing, Broken*		X	X	X			X	

GENERAL for the WORLDS of :

RECREATION

To be able to use advanced dimensioning for recreational enjoyment where the proper adherance to standards, even though often drawn hastily as a freehand, understanding and the doing of prescribed work, whatever.

Also, of course, the ability to correctly evaluate "sports" items and to properly interpret specification and Bills of Materials documents before spending good money for recreational items...whatever check- next "Living" Column for examples.

LIVING

To utilize gained advanced dimensioning knowledge for everyday living purposes. As is the case in improved and more critical evaluation of consumer goods. By very thorough examination of specification of the item itself in the light of sales claims, warranties, signed documents, etc., before the purchase of major cost items, for example:

1. *Can openers*
2. *Automatic carving knives*
3. *Shavers*
4. *Hair driers; large and small*
5. *Submersible well pumps*
6. *Evacuation pumps*
7. *Clothes washers*
8. *Driers*
9. *Floor model ironers*
10. *Alternate generators*
11. *Hot water heaters*
12. *Hot air furnaces*
13. *Electrical supply panel*
14. *Exhaust fans; kitchen, attic*
15. *Air consitioners*
16. *Sewing machines*
17. *Lawn mowers*
18. *Mix Masters*
19. *Faucet valving*
20. *Refrigerators*
21. *Ranges*
22. *Auto batteries*
23. *Automobiles*
24. *Bicycles*
25. *Snowmobiles*
26. *Ladders*
27. *Shoes, etc.*

RELATED

Career identification can be furthered in this area of advanced dimensioning:

1. *Machine Design*
2. *Tool and Jog Design*
3. *Design Drafting*
4. *Detail Drafting*
5. *Computer Drafting...Programming, Punch-Out, Computer Assisted Designing*
6. *Tool and Die Making*
7. *Design Management*
8. *Manufacturing Supervisor*
9. *Machinist*
10. *Leadman*
11. *Foreman*
12. *Bench Mechanic/Fitting*
13. *Welding*
14. *Quality Control*
15. *Parts Testing*
16. *Pattern Making*
17. *Casting*
18. *Foundry*
19. *Rolling Mills*
20. *Press Operators*
21. *Pipe Fitting*
22. *Safety Engineers*
23. *Advertising*
24. *Packaging*
25. *Industrial Design, etc.*

AREA CONTENT	LEVELS: COURSE				GRADE			GOALS --- WORK
	I	II	III	IV	K/6	5/9	9/12	
10. *Leader Lines...Edge Contact, Surface, Placement of Origin Line*								*Same as immediately prior area of advanced dimensioning.*
11. *Diameters...Longitudinal*								
12. *Radii...Internal, External, Shortened, Locations (Center, Tangent, True), Spherical, Chords, Arcs, Angles, Rounded Ends, Multiple Tolerance, Rounded Corners.*								
13. *Irregular Outlines...Datum (Baseline), Tabulated, Symmetrical*								
14. *Radial Holes...Round, Slotted, Counterbored, Countersunk, Counterdrilled, Spot Face*								
15. *Machining Centers*								
16. *Chambers*								
17. *Key Seats*								
18. *Knurling*								
19. *Rods and Tubing*		X	X	X			X	
20. *Symmetrical Hole Locations..,Common Corner, Coordinate (Baseline and Center Datum), Rectangular Coordinate, (Center Datum), Polar Coordinate, Repetitive, Rectangular Coordinate (Baseline), Rectangular Coordinate Dimensions without Dimension Lines, Rectangular Tabular Coordinate.*		X	X	X			X	
21. *Datum Target*			X	X			X	
22. *Nominal Size*		X	X	X			X	
23. *Actual Size*		X	X	X			X	
24. *Pictorial...Axonometric, Oblique-Presentation Plane (Aligned), Horizontal (Unidirectional) Alignment*		X	X	X			X	

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[1] *5-1, ANSI Y14.5 - 1973*

GENERAL for the WORLDS of :

RECREATION	LIVING	RELATED
To be able to use general tolerancing procedures and applications for recreational enjoyment where the proper adherance to standards even though often drawn hastily and freehand will provide correct tolerance information and facilitate correct restructuring, new construction, or whatever to allow old items to continue in use and perhaps to improve upon original performance as well as create new recreational adaptations, etc. *1. Maintain and repair outboard engines* *2. Maintain and repair snowmobiles* *3. Maintain and repair dragster engines:* *a. bearings* *b. rings* *c. camshaft* *d. valves*	*To utilize gained general tolerancing knowledge for everyday living purposes... in effect, to be a more critical consumer of manufactured produce as in the case of advanced dimensioning, prior unit.*	*Career identification would be the same here as for advanced dimensioning.*

AREA CONTENT	LEVELS:							GOALS ---
	COURSE				GRADE			WORK
	I	II	III	IV	K/6	5/9	9/12	
Areas of Involvement-								
XXI GENERAL TOLERANCING: Depiction of established practices for indicating tolerances on linear and angular dimensions, material condition modifiers, and interpretation of limits and tolerance rules.[1]								*For general tolerancing, here again to knowledgeably depict in standardized drafting language form (ANSI Y14.5, 1973), all items pertaining to general tolerancing as per th dimensioning and tolerancing manual.*
A. APPLICATION OF: *1. Direct/Local* *2. Special Notation* *3. Other Document Referencing* *4. General Tolerance Notation*		X	X	X			X	
B. METHOD OF PLACEMENT *1. Limit Definition* *2. Plus and Minus Definition*		X	X	X			X	
C. TOLERANCE EXPRESSION- DECIMAL PLACES		X	X	X			X	
D. LIMIT INTERPRETATION- ABSOLUTE			X	X			X	
E. SINGLE LIMITS- MINIMUM AND/OR MAXIMUM		X	X	X			X	
F. TOLERANCE ACCUMULATION- CHAIN, DATUM, DIRECT		X	X	X			X	
G. ANGULAR SURFACES		X	X	X			X	
H. CONICAL TAPERS- LINEAR AND ANGULAR DIMENSIONS, BASIC ANGLE, BASIC TAPER, TAPER TOLERANCE, BASIC TAPER AND BASIC DIAMETER, BASIC TAPER AND BASIC LENGTH		X	X	X			X	
I. FLAT TAPERS- CHANGE PER INCH		X	X	X			X	

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[1] *ANSI Y14.5, 1973, 5 - 2.*

GENERAL for the WORLDS of :		51
RECREATION	LIVING	RELATED
165		166

	LEVELS:							GOALS ----
AREA CONTENT	COURSE				GRADE			WORK
	I	II	III	IV	K/6	5/9	9/12	
XXI GENERAL TOLERANCING, CONTINUED-								Again, the same here as the immediately prio area of Advanced Dimensioning and the first part of General Tolerancing.
J. TOLERANCED RADII- UNLOCATED CENTERS, MINIMAL, MAXIMAL, ACCEPTABLE		X	X	X			X	
K. SIZE LIMITS RELATED TO FORM CONTROL- INDIVIDUAL FEATURES OF SIZE, MMC, LMC, EXTREMES, COMBINATIONS, INTERRELATED FEATURES		X	X	X			X	
L. APPLICABILITY OF MMC OR RFS: TOLERANCE OF POSITION, ALTERNATE PRACTICE, EFFECT OF RFS, MMC, ZERO TOLERANCING AT MMC		X	X	X			X	
M. SCREW THREADS		X	X	X			X	
N. GEARS AND SPLINES		X	X	X			X	
O. VIRTUAL CONDITIONS			X	X			X	
XXII SYMBOLOGY DEPICTION: Those symbols used for specifying geometrical characteristics on engineering drawings and use of notes to supplement symbols.[1]			X	X			X	For symbology depiction, here also, to knowledgeably depict in standardized drafting language form (ANSI Y14.5, 1973) all items pertaining to symbology as per the dimensioning and tolerancing manual.
A. SYMBOL CONSTRUCTION: 1. Geometric Characteristic 2. Datum Identifying 3. Basic Dimension 4. MMC and RFS 5. Diameter 6. Projected Tolerance Zone 7. Reference Dimension 8. Datum Target								The objectives here are to learn by memory or ready reference, use all ANSI approved abbreviations since they are total and in constant industrial use.
167								168

[1] ANSI Y14.5, 1973, 5 - 3

GENERAL for the WORLDS of :

RECREATION	LIVING	RELATED
To be able to use symbology depictions procedures and applications for recreational enjoyment...as would be the case for speedy depiction and interpretation of data relative to for example; *1. Canoe* *2. Sailboat* *3. Outboard engine* *4. Motorcycle repair manual understanding when field testing new bike miles from nowhere* *5. Same for snowmobile as for motorcycle, etc.*	*To utilize gained symbology knowledge for normal daily living purposes, in effect; the business of being a knowledgeable consumer looms largest on the horizon...* *1. To intelligently explore and evaluate potential sales items* *2. To then intelligently purchase based on known facts and conditions relative to: Design* *Materials* *Workmanship* *Function* *Reliability* *Longevity* *Ease of maintenance* *3. To then properly use the time(s) relative to specification use parameters* *4. To then apply specified preventive maintenance procedures* *5. To repair only when needed and strictly by the manual.*	*Career identification would continue to be the same here as for the prior areas of ADVANCED DIMENSIONING, and GENERAL TOLERANCING.*

	LEVELS:							GOALS ----
AREA CONTENT	COURSE				GRADE			WORK
	I	II	III	IV	K/6	5/9	9/12	
B. COMBINED SYMBOLS: 1. Feature Control 2. Feature Control Incorporating Datum Reference 3. Combined Feature Control and Datum Identifying 4. Combined Feature Control and Projected Tolerance C. FEATURE CONTROL SYMBOL PLACEMENT 1. Symbol Addition to Note or Dimension Pertaining to Feature 2. Leader Connection from Feature to Symbol 3. Extension Line Connection Between Side, End, Corner of Symbol Frame to Feature 4. Dimension Line Connection Between Side, End, Corner of Symbol Frame to Feature D. IDENTIFICATION OF TOLERANCE ZONE E. TABULATED TOLERANCES								

GENERAL for the WORLDS of :

RECREATION	LIVING	RELATED
173		174

AREA CONTENT	LEVELS:							GOALS ———
	COURSE				GRADE			WORK
	I	II	III	IV	K/6	5/9	9/12	
XXIII *DATUM REFERENCING UTILIZATION: The use of established principle of datum referencing to relate features of a part to an appropriate datum:*[1] *A. APPLICATION OF:* *1. Datum Reference Frame* *2. Datum Features* *B. DATUM FEATURE SEQUENCE:* *1. Primary- First Datum Plane* *2. Secondary- Second Datum Plane* *3. Tertiary- Third Datum Plane* *C. PARTS WITH CYLINDRICAL DATUM FEATURES:* *1. Three Plane Relationship* *2. Angular Orientation* *D. DATUM FEATURES SUBJECT TO SIZE VARIATIONS* *1. Primary Datum Feature, RFS* *2. Secondary Datum Feature, RFS* *3. Secondary Datum Feature at MMC* *E. DATUM TARGETS...DEFINITION OF POINTS, LINES, AREAS:* *1. Datum Target Dimensioning* *2. Datum Target Points, Lines or Areas* *3. Datum Target Application*			X	X			X	*To be able to use datum referencing knowledgeably as it pertains to established ANSI Standards ANSI Y14.5, 1973 Dimensioning and Tolerancing Manual.* *Proper and correct drafting room procedures require a thorough understanding for the world of work; the manufacturing/industrial/military domain of production.*

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[1] *ANSI Y14.5, 1973, 5.4*

[2] *IBID, 5.5*

GENERAL for the WORLDS of :

RECREATION	LIVING	RELATED
To be able to use datum referencing procedures and applications for recreational enjoyment...as would be the case for correct and proper, yet speedy depiction and interpretation of data relative to assurance of recreational activities, for example; 1. Motorboating- repair to engine- datum referencing required, head tightening 2. Sailboating- repair to center plane- positioning off due to erosion and wear, true position (datum) fastening required 3. Outboard engine- water skiing... timing off- firing position worn off, advance and retard not visible, datum marking required 4. Proper assembly of newly purchased solid camp shelter. Contractors bench mark, engineering datum point for referals must be found 5. In short, home plate, the point of engineering referencing must be found and adhered to for correct assembly, originally and proper reassembly upon being torn-down for maintenance and repair, etc.	To utilize gained datum referencing knowledge for normal daily living purposes, in effect; better informed and more functional consumer practices and procedures as per symbology depiction area on prior page.	Career identification would continue to be the same here as for the prior areas of: ADVANCED DIMENSIONING GENERAL TOLERANCING SYMBOLOGY DEPICTION
The above could also apply to the applied recreational use of tolerances of location.	The above can also relate to the applied daily living purposes of tolerances of location.	Career identification remains constant here.

	LEVELS:							GOALS ---
AREA CONTENT	COURSE				GRADE			WORK
	I	II	III	IV	K/6	5/9	9/12	
XXIV *TOLERANCES OF LOCATION: The utilization of established principles of tolerances of location relative to position, concentricity, and symmetry to control:*			X	X			X	*To be able to knowledgeably depict in established drafting standards practices, as per ANSI Y14.5, 1973, tolerances of location as specified by the ANSI Dimensioning and Tolerancing Manual.*
A. CENTER DISTANCES BETWEEN FEATURES such as holes, slots, bosses, and tabs								
B. LOCATION OF ABOVE (A) AS A GROUP from datum features such as plane and cylindrical surfaces								
C. COASIALITY BETWEEN FEATURES								
D. FEATURES WITH CENTER DISTANCES equally disposed about a datum axis or plane								
E. POSITIONAL TOLERANCING AND SPECIFICATIONS THEREOF								
F. FEATURE PATTERN LOCATION								
G. PROJECTED TOLERANCE ZONE								
H. PARALLEL HOLES								
I. COUNTERBORED HOLES								
J. FEATURE VARIABLE END CONTROL								
K. NON-CIRCULAR FEATURES								
L. COAXIALITY CONTROLS								
M. SYMMETRY								

GENERAL for the WORLDS of :

RECREATION	LIVING	RELATED
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	LEVELS:							GOALS ---
AREA CONTENT	COURSE				GRADE			WORK
	I	II	III	IV	K/6	5/9	9/12	
XXV TOLERANCES OF FORM AND RUNOUT: The depiction of established principles and methods of dimensioning and tolerancing controlling shape and runout of varying geometric forms and freestate variations:[1] *A. FORM CONTROL* *B. FORM TOLERANCE SPECIFICATIONS* *C. FORM TOLERANCES FOR SINGLE FEATURES* *D. FORM TOLERANCES FOR PROFILE FEATURES* *E. FORM TOLERANCES FOR RELATED FEATURES* *F. RUNOUT FEATURES* *G. FREESTATE VARIATION*		X	X	X			X	*To knowledgeably depict in standardized drafting language usage as per the ANSI Y14.5, 1973, Dimensioning and Tolerancing Manual:* *1. Tolerances of form and runout* *2. Dual dimensioning* *3. Dimensioning for numerical control* *4. Formulae for positional tolerancing* *5. All of above A, B, C, and D, in their total ramifications:* *a. Symbolically* *b. Vocabulary* *c. Applied math formulas*
XXVI DUAL DIMENSIONING: Depiction of U.S. inch and SI Metric units of measurements on same drawing:[2] *A. INTERCHANGEABILITY* *B. IDENTIFICATION OF UNITS* *C. SI VALUES PRACTICES*			X	X			X	

GENERAL for the WORLDS of :

RECREATION	LIVING	RELATED
To be able to use those tolerances of form and runout, dual dimensioning, dimensioning for numerical control, and formulae for positional tolerances for recreational enjoyment...as would be the case for speedy depiction and interpretation of data relative to: A. Directions for assembly and maintenance and repair of; 1. tents 2. solid shelters 3. boats (kit form) 4. engines 5. pre-fab fireplaces 6. pre-fab plumbing, etc.	To utilize gained knowledge concerning tolerances of form and runout, dual dimensioning, formulae for positional tolerancing and dimensioning for numerical control for applied daily living purposes...in effect; enlightened consumerism as per prior breakdown in area of symbology depiction "World of Living".	Career identification would continue to be the same here as for the prior areas of: ADVANCED DIMENSIONING GENERAL TOLERANCING SYMBOLOGY DEPICTION DATUM REFERENCING UTILIZATION TOLERANCES OF LOCATION...

AREA CONTENT	LEVELS:							GOALS ---
	COURSE				GRADE			WORK
	I	II	III	IV	K/6	5/9	9/12	
XXVII DIMENSIONING FOR NUMERICAL CONTROL: Application of dimensioning and tolerancing practices for parts delineation and machining as it relates to computer assisted design and manufacturing:[3]			X	X			X	
A. COORDINATE SYSTEM								
B. AXIS NOMENCLATURE								
C. DIMENSIONING AND TOLERANCES								
D. COMPUTER PROGRAMMING LANGUAGE								
XXVIII FORMULAE FOR POSITIONAL TOLERANCING: Proper use of formulae for determining required positional tolerances or required sizes of mating features to ensure required parts assembly:[4]			X	X			X	
A. SYMBOLS								
B. FLOATING FASTENER CASE								
C. FIXED FASTENER CASE								

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[1] ANSI Y14.5, 1973, 5.6
[2] IBID, 5.7
[3] ID, Appendix
[4] ID, Appendix

GENERAL for the WORLDS of :

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RECREATION	LIVING	RELATED

AREA CONTENT	LEVELS: COURSE				GRADE			GOALS ——— WORK
	I	II	III	IV	K/6	5/9	9/12	
XXVIII FORMULAE FOR POSITIONAL TOLERANCING, cont'd D. COAXIAL FEATURES E. PROVISION FOR OUT OF SQUARENESS			X	X			X	To knowledgeably depict in proper proportion and form all geometric characteristic symbols as for ANSI Y14.5, 1973 standards. In addition, the "World of Work" requires a knowledgeable understanding of other than our American System, in effect;
XXIX FORM, PROPORTION, AND COMPARISON OF SYMBOLS: Depiction of ANSI Y14.5, 1973 American National Standard engineering drawing and related documentation practices pertaining to recommended forms and proportion for geometric characteristics symbols:[1] A. GENERAL B. PROPORTIONS C. COMPARISON			X	X			X	A. British.........BS 308 B. Canadian........CSA B78.2 C. International...150 R1101
XXX INDUSTRIAL DRAFTING: Shop processes, or those areas of industrial activities which every drafting oriented process must require a thorough understanding of in order to knowledgeably depict in drafting terms drawings pertaining to: A. PATTERNMAKING B. FOUNDRY C. CASTING		X	X	X			X	To knowledgeably depict in established drafting language form (ANSI) those peculiarities dealing with symbolism rather than orthographic realities when defining unusual geometric intersections as per: A. Runouts B. Conventional edges C. Tangencies Also, a thorough understanding of the accepted vocabulary established for industrial manufacturing purposes found in most engineering drawing manuals appendix, technical terms. ..Also, ANSI Y1.1, 1972

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[1] ANSI Y14.5, 1973, Appendix

GENERAL for the WORLDS of :

RECREATION

To be able to use those form, proportion, and comparison of symbol depictions for recreational enjoyment as, for example, the ability to properly read and interpret object geometric characteristics on drawings of recreational devices when assembling, maintaining, and repairing such devices. This especially if they are British, Canadian, or European (Mainland), and Asian:

A. Bicycles

B. Various Games

C. Sports Firearms

LIVING

To utilize gained knowledge concerning form, proportion, and comparison of symbols for improvement of everyday living especially in the area of consumerism. For example:

A. To be able to read and interpret drawings, specifications, and Bills of Materials for home-based devices such as:

1. Well pumps
2. Furnace blowers
3. Air conditioners
4. Windows
5. Food-preparation articles

for best material(s), joints, longevity, etc.

RELATED

Career identification would continue to be the same here as for the prior areas of:

A. ADVANCED DIMENSIONING

B. GENERAL TOLERANCING

C. SYMBOLOGY DEPICTION

D. DATUM REFERENCE UTILIZATION

E. TOLERANCE OF LOCATION

F. TOLERANCES OF FORM AND RUNOUT

G. DUAL DIMENSIONING

H. DIMENSIONING FOR NUMERICAL CONTROL

I. FORMULAE FOR POSITIONAL TOLERANCING

J. FORM, PROPORTION AND COMPARISON OF SYMBOLS

K. INDUSTRIAL DRAFTING SHOP

L. THREADED FASTENERS

AREA CONTENT	LEVELS: COURSE				GRADE			GOALS --- WORK
	I	II	III	IV	K/6	5/9	9/12	
XXX INDUSTRIAL DRAFTING, cont'd		x	x	x			x	
D. ROLLING								
E. PRESSING								
F. FORGING								
G. MACHINING								
H. FITTING								
I. QUALITY CONTROL								
J. ASSEMBLING								
K. BILLS OF MATERIALS								
L. SPECIFICATIONS								
M. NOTES								
XXXI THREADED FASTENERS, EXTERNAL AND INTERNAL.. Bolts, screws, heads, nuts (machine only):[2]		x	x	x			x	To knowledgeably depict in established drafting language form, ANSI Y14.6, 1957, all those threaded fastener forms which are essential for acceptable and true depiction on any engineering drawing:
A. HELIX (THEORY AND MATH)								
B. DETAILED (SEMI-CONVENTIAL)								A. Axis (es)
1. Sharp Vee 2. American Standard								B. Major (Crest) Diameter
3. Whitworth 4. Unified								C. Minor (Root) Diameter
5. Square 6. Acme								D. Pitch Diameter
7. Brown and Sharpe								E. Pitch (or lead)

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[2] ANSI Y14.6, 1957

GENERAL for the WORLDS of :

RECREATION	LIVING	RELATED
To be able to use those industrial drafting shop processes for recreational applications, such as in maintenance and repair of sports devices, for example; A. Cracked cylinder head 1. Braze and machine B. Cracked block 1. Same C. Smashed pulley 1. Pattern 2. Casting 3. Machining D. Lost wrench 1. Drasing 2. Layout 3. Forge hammer 4. Fitting/finish, etc.	To utilize gained knowledge concerning industrial drafting and shop processes for the same everyday living purposes as above unit. But in addition, have the knowledge (and ability) to be able to better maintain and repair particularly expensive home-based items; 1. Repairing broken knife handles, gluing and fitting new wood 2. Recasting new knife handle for old 3. Forging new blade for old (broken one	

AREA CONTENT	LEVELS: COURSE I	II	III	IV	GRADE K/6	5/9	9/12	GOALS --- WORK
XXXI THREADED FASTENERS, cont'd		X	X	X			X	F. Thread Formulae G. Thread Angle (Nominal Drawn)
8. Worm 9. Knuckle 10. Buttress								H. Thread Depth I. External
C. SYMBOLIC...(CONVENTIAL) 1. Schematic 2. Simplified								J. Internal K. Schematic Depth and Pitch Table
D. MULTIPLE LEADS E. THREAD NOTES...SPECIFICATIONS F. TYPES OF FASTENERS:								L. Thread Form Tables: 1. Nominal Diameter 2. Actual Diameter 3. Number of threads per inch 4. Tap drill sizes 5. Coarse, fine extra fine 6. Pitch Series...8,12,16
1. American Standard machine screws... round head, flat head, oval head, fillister head 2. American Standard cap screws... hexagon head, flat head, round head, fillister head, hex head 3. American Standard set screws... square head, slotted, hex socket, fluted socket, cup point, flat point, oval point, full dog point, half dog point, cone point.								M. Twist Drill (for threading) 1. Number or guage size 2. Fractional sizes 3. Decimal sizes 4. Letter sizes N. Shaft Center Sizes (center drill) 1. Chamfer 2. Pilot Hole Diameter 3. Pilot Hole Depth
G. AMERICAN STANDARD PIPE THREADS 1. Tapered 2. Straight H. AMERICAN STANDARD BOLTS AND NUTS... HEXAGON AND SQUARE, REGULAR AND HEAVY SERIES								O. Thread Length Sizes, Incremental P. USA Standard Taper Pipe Threads 1. Nominal Pipe size 2. Outside Diameter (O.D.) 3. Threads per inch (different) 4. Tap Drill sizes

GENERAL for the WORLDS of :

RECREATION	LIVING	RELATED
To be able to effectively use those threaded fastener information units for recreational application as will further the better: A. Purchase of recreational devices B. Maintenance of such recreational devices C. Long-term repair of such recreational devices D. Improved use of items (reliance on joinery- faith in, based on knowledge)	To utilize gained knowledge concerning threaded fasteners...for same daily-living purposes as above unit...since this type of fastening has so many universal applications it could after purchase of new items, or when maintaining and repairing of same or other items displace all original joinery so far as normally possible with screws or nuts and bolts.	Career identification continues to be the same here as for the prior areas of: A. ADVANCED DIMENSIONING B. GENERAL TOLERANCING C. SYMBOLOGY DEPICTION D. DATUM REFERENCE UTILIZATION E. TOLERANCES OF LOCATION F. TOLERANCES OF FORM AND RUNOUT G. DUAL DIMENSIONING H. DIMENSIONING FOR NUMERICAL CONTROL I. FORMULAE FOR POSITIONAL TOLERANCING J. FORM, PROPORTION AND COMPARISON OF SYMBOLS K. INDUSTRIAL DRAFTING SHOP PROCESSES

	LEVELS:							GOALS ---
AREA CONTENT	COURSE				GRADE			WORK
	I	II	III	IV	K/6	5/9	9/12	
XXXI THREADED FASTENERS, cont'd		X	X	X			X	*To knowledgeably depict in established drafting language form, ANSI Y14.6, 1957...cont'd*
H. AMERICAN STANDARD BOLTS AND NUTS, cont'd								*Q. Regular and Heavy-Duty Bolt and Nut Heads*
1. Unfinished								*1. Width across flats= W*
2. Semi-finished								*2. Height of heads= H (thickness of)= T*
3. Finished								
I. THREAD CLASSES								*R. Cap and Machine Screw*
1. External...A, 2A, 3A								*1. Head information*
2. Internal...B, 2B, 3B								*2. Shaft length*
3. Holdover...2,3								*3. Thread length*
4. Acme, general purpose...2G, 3G, 4G								*4. Shaft ending*
5. Acme centralizing...2C, 3C, 4C, 5C, 6C								
6. Buttress...1,2,3...(Free, Medium, and Close)								
J. STUDS								
K. AMERICAN STANDARD WOOD SCREWS...SLOT, PHILLIPS, ETC.								
1. Flat head								
2. Round head								
3. Oval head								

GENERAL for the WORLDS of :

RECREATION	LIVING	RELATED
		Career identification, cont'd L. THREADED FASTENERS 1. Engine lathe operator 2. Turret lathe operator 3. Milling machine operator a. horizontal b. vertical 4. Grinding cylinder operator 5. Specialty machine operators a. broaching b. planning c. shaping d. profiling e. tappers f. engravers, etc. 6. Sales people

AREA CONTENT	LEVELS:							GOALS --- WORK
	COURSE				GRADE			
	I	II	III	IV	K/6	5/9	9/12	
Areas of Involvement, cont'd								To not only learn to draw all these fastening devices correctly as per ANSI requirements, but to also learn the specifics of their:[1] 1. Composition 2. Design 3. Purpose 4. Manufacture 5. Availability 6. Applied use(s) This above, in as total a range as possible, first-hand, hands-on experience in learning about and handling them is desired...only by direct experiential knowledge can functional expertise for correct drafting and design be assured.
XXXII FASTENERS, EXTENDED...All those fastening agents not covered in Drafting II shall be presented here. Generally they are more sophisticated than simple threaded cap, machine, set, wood, screws and bolts and pipe threads. These, therefore, are used as follows:			X	X			X	
A. LOCKING HEAD-BOLT AND CAP SCREWS...hex-head washer, slotted-hex head washer, 12-point head washer, T-head, square-CSK head, ribbed neck, round CSK-key-head plow, oval and ellipse-neck, track, slotted-binding head.			X	X			X	
B. LOCK NUTS, REGULAR...track bolt, hex jam, hex slotted, hex castle, hex cap (acorn), hex-flange plate.			X	X			X	
C. LOCK NUTS, FREE-SPINNING...nylon, fiber, copper insert, nylon pellet, flowed-in sealant.			X	X			X	
D. LOCK NUTS prevailing torque.			X	X			X	
E. CAPTIVE OR SELF RETAINING NUTS...Plate or anchor, caged, clinched, self-piercing.			X	X			X	
F. SINGLE THREAD LOCK NUTS- (sheet metal)...inward thread, arched spring, flat-conical, spiral formed.			X	X			X	
G. SELF-TAPPING SCREWS...self-drilling, tapping with built-in washers, sealing washers.			X	X			X	

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[1] ANSI= American National Standards Institute

GENERAL for the WORLDS of :

RECREATION

A reasonable knowledge about these involved fasteners, in effect, their existence and availability will make life easier in the original design, construction, as well as maintenance, and repair of recreational devices...

1. Sports
2. Exercise
3. Hobby
4. Relaxation

LIVING

The same reasonable knowledge here applied to daily existance requirements can make the consumer's life less expensive and more enjoyable by:

1. Discreet and knowledgeable purchasing
2. Ability to read specs
3. Maintain his purchases
4. Repair his purchases

This, relative to all things he or she owns which must be repaired, disassembled and then reassembled by the owner, if possible.

RELATED

Present and future career identification can be assured here by virtue of designing, repairing, and maintaining most existing and future manufactured items. All must be assembled in some way. The concept and application of fastening and fasteners is prime, thus listed are the following related career choices:

1. Machinists
2. Auto/Power Mechanics
3. Auto Body and "Fenderers"
4. Electricians
5. Electronics Repairers
6. Contractors/Builders
7. Carpenters
8. Masons
9. Cabinet Makers
10. Designers, General
11. Designers, Applied
12. Drafters
13. Detailers
14. Engineers, Mechanical
15. Engineering Managers
16. Hardware Owner
17. Hardware Salesman
18. Riveters
19. General Fixit Mechanics
20. Model Makers
21. Solar Energy Mechanic
22. Ecology Planners, etc.

AREA CONTENT	LEVELS:							GOALS --- WORK
	COURSE				GRADE			
	I	II	III	IV	K/6	5/9	9/12	
XXXII FASTENERS, EXTENDED, cont'd								Prior information on pages three and four apply here as well.
H. WASHERS...flat, conical, ramp conical, helical spring, plain-non-link positive, tooth lock, spring lock, special purpose, sealing			X	X			X	
I. INSERTS...helical, self-tapping, pressed-in, molded-in, thin material, sandwich panel.			X	X			X	
J. MASONRY FASTENERS...ductile-sleeve-lead anchors, sleeve and pin anchors, shield and wedge anchors, self-drilling anchors, spring-drive bolts, hollow wall fasteners, stud-power-charge nails, concrete nails			X	X			X	
K. WOOD FASTENERS...wrought and forged nails, cut nails, wire nails, resin-coated nails, screw nails, spikes, tacks, flat-wire double-point tacks, fence staples, glazier points, corrugated fasteners.			X	X			X	
L. KEYS AND KEYWAYS...flat, square, gib-head, Pratt and Whitney, woodruff.			X	X			X	
M. SPLINES AND SERRATIONS			X	X			X	
N. PIN FASTENERS...machine, radial-locking, grooved straight, quick-release, push-pull, positive-locking			X	X			X	
O. RETAINING RINGS...axial-assembly, end-playtake-up, self-locking, radial assembly			X	X			X	

GENERAL for the WORLDS of :

RECREATION	LIVING	RELATED
Prior information on pages three and four apply here as well.	Prior information on pages three and four apply here as well.	Prior information on pages three and four apply here as well.

AREA CONTENT	LEVELS:							GOALS --- WORK
	COURSE				GRADE			
	I	II	III	IV	K/6	5/9	9/12	
XXXII FASTENERS EXTENDED, cont'd								*Information on pages three and four apply here as well.*
P. SPRINGS...compression, torsion, extension, flat, power.			X	X			X	
Q. SPRING CLIPS, DART TYPE...stud receiver, cable, wire and tube, spring molding, "U, S, and C"-shaped clips, compression-ring.			X	X			X	
R. RIVETS...standard, large, small, lap and butt joints, corner joint. Types= button, acorn, cone, pan, flat-top (CSK), round (CSK), bifurcated, blind.			X	X			X	
S. ADHESIVE FASTENING...tensile, cleavage, shear, peel via lap, angle, butt, stiffener, corner, and cylindrical-slip joints. Types of material= woods, metals, cloths, paper board, plastics, rubber, vellum, etc.			X	X			X	

GENERAL for the WORLDS of :

RECREATION	LIVING	RELATED
Prior information on pages three and four apply here as well. 217	Prior information on pages three and four apply here as well.	Prior information on pages three and four apply here as well. 218

AREA CONTENT	LEVELS: COURSE I	II	III	IV	GRADE K/6	5/9	9/12	GOALS — — — WORK
Areas of Involvement, cont'd XXXIII ELECTRONICS DEPICTION...Electrical and electronic drawings dealing with graphical symbols, linear direction, and related math values: A. ARCHITECTURAL ELECTRICAL 1. Circuit...series, parallel, and series-parallel 2. Distribution (panel) box 3. Specification break-down of system(s) B. ELECTRONICS 1. Block Diagrams 2. Schematics 3. Pictorials 4. Printed Circuit: assembly components layout, master layout, bottom side of unit, drilling positioning layout, multi-component layout- top and bottom, connection diagram, control diagram, highway diagram, single-line diagram, base-line diagram. 5. Parts List identification 6. Assigned values- notes 7. Conductors: pad-straight fillet, pad-curved fillet, elbow, tee, double pad.		X	X	X			X	To knowledgeably depict in established drafting language form that data which requires interpretation through the use of:[1] A. FORMULAS: 1. Electrical 2. Electronics 3. Inductance 4. Capacitance B. TABLES: 1. Color coding (resistors and capacitors) 2. Abbreviations and letter symbols 3. Wire table sizes 4. Math tables, values, conversion C. DIAGRAMS 1. Starter/regulators 2. Transformers 3. Full-wave power supply 4. Radio transmitter 5. Waveshapes 6. Frequency range chart D. GRAPHICAL SYMBOLOGY E. NATIONAL ELECTRIC CODE STANDARDS 1. Building services 2. Service entries 3. Safeties...fuse/breakers 4. Conductors 5. General outlets 6. Convenience outlets 7. Switch outlets 8. Panels 9. Outlet boxes 10. Circuits

GENERAL for the WORLDS of :

RECREATION

To be able to effectively use those elements of electronics and electrical depiction for purposes of recreational enjoyment for example;

A. The planning, drawing of, wiring up of, and eventual upkeep and repair of:

  1. Vacation cabin
  2. Ham radio station
  3. Scout camp P.A. system
  4. Alternate power generator for scout camp
  5. Establishing walkie-talkie scouting-party communications, etc.

LIVING

To utilize E. and E. gained knowledge for purposes of improving everyday living, especially in the enlightened consumer area...This knowledge should improve research and buying of all kinds of E. and E. components and parts- be it simple house wiring to quadraphonic systems- for now the ultimate reference relative to systems, parts, assembly, use and maintenance should be accessible...standards, codes, manuals, and consumers research groups.

RELATED

Career identification would include the original drafting dimensioning oriented job areas consistantly referred to in:

A. ADVANCED DIMENSIONING
B. GENERAL TOLERANCING
C. SYMBOLOGY DEPICTION
D. DATUM REFERENCE UTILIZATION
E. TOLERANCES OF LOCATION
F. TOLERANCES OF FORM AND RUNOUT
G. DUAL-DIMENSIONING
H. DIMENSIONING FOR NUMERICAL CONTROL
I. FORMULAE FOR POSITIONING TOLERANCING
J. FORM PROPORTION AND COMPARISON OF SYMBOLS
K. INDUSTRIAL DRAFTING PROCESSES
L. THREADED FASTENERS

As well as these E/E centered:

A. Camera, lense design
B. Camera, meter design
C. Camera troubleshooting
D. Communications
  1. TV, radio
  2. Media instruction
  3. Radar
  4. Telegraphy
  5. Teletypists
  6. Telephone
  7. Announcers/Operators

	LEVELS:							GOALS ---
AREA CONTENT	COURSE				GRADE			WORK
	I	II	III	IV	K/6	5/9	9/12	
Areas of Involvement, cont'd								
XXXIII ELECTRONICS DEPICTION, cont'd								

GENERAL for the WORLDS of :

RECREATION	LIVING	RELATED
		E. Computer Area 1. Programmers 2. Key punch operators 3. Computer operators 4. Computer technicians 5. Industrial robot F. Construction electrician G. Control mechanism technician H. E/E authors I. General electrician J. E/E engineering K. E/E teaching L. E/E inspector M. E/E fixture designer N. Lighting director, stage O. X-Ray technician P. Machine-Applied E/E 1. Set-up 2. Operation 3. Maintenance and repair Q. Electronics lab technician, etc.

AREA CONTENT	LEVELS: COURSE				GRADE			GOALS — — —
	I	II	III	IV	K/6	5/9	9/12	WORK
Areas of Involvement, cont'd								
XXXIV WELDING...The fusion or joining of two or more pieces of metal via heat with or without the application of pressure[2].		X	X	X			X	
A. BRAZING (AND SOLDERING)								
B. FORGE								
C. GAS								
D. THERMIT								
E. ARC								
F. INDUCTION								
G. RESISTANCE								
H. FLOW								
I. JOINTS								
1. Butt								
2. Corner								
3. Tee								
4. Lap								
5. Edge								

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[1] This reference information is based on ANSI publications: Y14.15, 1966, "Electrical and Electronics Diagrams"; Y14.152, 1971, "Supplement-Interconnecting Diagrams"; Y32.2, 1970, "Graphic Symbols for Electrical and Electronics Diagrams", all published by the society of Mechanical Engineers.

[2] American Welding Society

GENERAL for the WORLDS of :

RECREATION

To be able to effectively use those elements of the welding process derived from drafting as will fulfill the recreational needs, whatever:

A. Better consumer buying of welded recreational equipment, for example;

1. Swings
2. Jungle gyms
3. Liquid containers
4. Dragster frames, etc.

B. Better preventive maintenance by subjecting welded parts to specified pressures/rigors only, for example;

1. Seam welded tanks
2. Brazed rocker panels
3. Welded strut frames of recreational vehicles, etc.

C. Improved joinery via stronger repair (Than original) joints for:

1. Canoes
2. Tubing frames of swings, jungle gyms
3. Water tank seams, etc.

LIVING

To utilize welding gained knowledge for purposes of improving everyday living, especially in the enlightened consumer area...better research of intended purchases as well as actual buying of improved consumer use of such items. This, followed by constant and correct preventive maintenance for longevity.

Some welding type activities that could be done at home are:

A. Soldering

1. Gutters
2. Climate control ductwork
3. Funnels
4. Pails, etc.

RELATED

Career identification would be similar to the original drafting dimensioning job areas, in addition, the following specialized welding situattions have been identified:

A. Welding and Related:

1. Sheet metal welding
2. Pipe welding
3. Automotives body welding
4. Gas welding
5. Electric arc welding
6. Mig/Tig welding
7. Forbe welding
8. Braze welding
9. Soft and hard soldering
10. Spot welding
11. Torch cutting
12. Stud welding
13. Atomic hydrogen welding
14. Pulsation welding
15. Projection welding
16. Seam welding
17. Butt welding
18. Flash welding
19. Inertia welding
20. Jig/Fixture welding
21. Blacksmithing
22. Drop hammer machine operator
23. Hydraulic forging machine operator
24. Forging toolmaker
25. Power hammer machine operator
26. Welding equipment maintenance technician
27. Welding equipment salesman
28. Welding quality control inspectors

	LEVELS:							GOALS ---
	COURSE				GRADE			
AREA CONTENT	I	II	III	IV	K/6	5/9	9/12	WORK
XXXIV WELDING, cont'd J. TYPES OF WELD 1. Fillet 2. Plug or Slot 3. Arc Spot or Seam 4. Square...Groove 5. Vee...Groove 6. Bevel...Groove 7. "YUU"...Groove 8. Jay...Groove 9. Flare...Groove 10. Flare-Bevel...Groove 11. Back or Backing 12. Melt-thru 13. Surfacing 14. Edge...Flange 15. Corner...Flange 16. Resistance Spot 17. Projection 18. Resistance Seam 19. Flash or Upset 20. Weld-all-around 21. Field Weld 22. Flush...Contour 23. Convex...Contour K. THE WELDING SYMBOL 1. Arrow Head (Near side, Far side) 2. Tail (Specifications, reference placement) 3. Main Body Information		X	X	X			X	To knowledgeably depict in established drafting language form that information which must be transmitted through the approved welding symbology, for example; A. Selection of Proper Joint(s) Governed by: 1. Intensity of load 2. Load characteristic(s) 3. Load application...steady, sudden, variable 4. Costs of joint preparation and welding processes B. Welding Positions: 1. Flat weld 2. Vertical weld 3. Horizontal weld 4. Overhead weld C. Welds/Beads: 1. Placement 2. Process 3. Spacing 4. Amount (number of) 5. Desired depth 6. Root penetration 7. Cross section 8. Length

GENERAL for the WORLDS of :

RECREATION	LIVING	RELATED
		29. Welding Certification Inspectors 30. Welding equipment manufacturers 31. Heat treating technicians 32. Welding gas manufacturers 33. Metallurgists, etc.

	LEVELS:							GOALS ---
AREA CONTENT	COURSE				GRADE			WORK
	I	II	III	IV	K/6	5/9	9/12	
XXXIV **WELDING, cont'd**		X	X	X			X	**D. Technical** 1. Regulators 2. Flame...Neutral, Carbonizing, Oxidizing 3. Electrode 4. AC/DC 5. Ground 6. Flux/Rod 7. Crater 8. Filler 9. Slag 10. Oxyacetylene 11. MIG/TIG 12. Iron Oxide 13. Hydrogen 14. Stud 15. Inertia 16. Pressure 17. Metal(s) composition
								Note: Wood- Furniture/Cabinetry will be found on next page in total.
XXXV **WOOD-FURNITURE/CABINETRY-** The depiction of details and assembly of wood products and their joinery, plus specification breakdown. A. PLANNING AND DESIGN B. PICTORIAL PRESENTATION 1. Isometric 2. Oblique 3. Perspective								

GENERAL for the WORLDS of :

RECREATION

To be able to effectively use those elements of the Wood- Furniture/Cabinetry process derived from Drafting as will fulfill the recreational needs, whatever in relation to:

A. Wood Structures

1. Camping shack
2. Camp supply cabinet
3. Camp kitchen built-ins, etc.

In relation to discreet buying of, i.e., good joinery, will withstand camping hardships, good wood for outdoor exposure, ease of assembly in view of illustrated directions, ease of possible repair...etc.

LIVING

To utilize Wood- Furniture/Cabinetry related gained Drafting knowledge for purposes of improving everyday living with special emphasis on the enlightened consumer aspect.

A. Kitchen/Clothing Area Cabinetry

B. Bedroom/Bath Area Built-ins

C. Furniture- All Kinds

D. Revision- Planning for anything Wood-Created in the House Relative to Renovation-updating, etc.

E. Original New Purchases in Furniture, etc.

RELATED

Career identification would be similar to the original Drafting-Dimensioning Job Areas. In addition, the following specialized situations are identified (comprehensive):

A. Wood Related

1. Cabinet maker
2. Assembler
3. Bench worker
4. Cabinet frame assembler
5. Detailer
6. Layout person
7. Millhand
8. Machine operator

	LEVELS:							GOALS ---
	COURSE				GRADE			
AREA CONTENT	I	II	III	IV	K/6	5/9	9/12	WORK
XXXV WOOD- FURNITURE/CABINETRY, cont'd		X	X	X			X	To knowledgeably depict in standardized drafting language form all items pertaining to wood-product design, in effect; furniture, cabinetry, built-ins:
C. DETAILS...PARTS & JOINTS D. ASSEMBLY, NORMAL E. EXPLODED DISPLAY F. EXPLODED WORKING ASSEMBLY G. BILLS OF MATERIAL H. SPECIFICATIONS I. NOTATIONS								A. Joinery- Main Types: 1. DADOS/Grooves 2. Rabbets 3. Dovetail 4. Finger 5. Mortise & Tenon 6. Tongue & Groove 7. Butt 8. Miter (Dowel, Spline, Feather) 9. Dowels/Pins 10. Blind 11. Splined 12. Feathered 13. Blocked 14. Wedged 15. Laps (Cross, Edge, "T", End, Dovetail) 16. Haunched (Mort & Ten) 17. Concealed (Mort & Ten) 18. Lock (Miter) B. Moldings- Main Types 1. Crown 2. Bed 3. Clamshell 4. Cove C. Fasteners- Essential 1. Glues 2. Screws (sometimes bolts too) 3. Nails 4. Corrugated 5. Dowels

GENERAL for the WORLDS of :

RECREATION

To be able to effectively use those elements of technical illustrations as will best serve the recreational needs:

A. Easier and/or better drawing and renditioning for those not gifted in free-hand drawing practices.

B. Ability to enhance photographic enlargements via technical drawing shading techniques.

C. Ability to design "decently" those items hobbyism would spawn...

1. Electric table lamps
2. Coffee tables
3. Chairs
4. Patent dreams, etc.

LIVING

To utilize technical illustration for daily living purposes...for a more enlightened consumer in his/her ability to better understand how to assemble purchased knock-down items:

A. Bookcases
B. Picnic Tables/Chairs
C. Outdoor Barbecues
D. Braziers
E. Gutter/Downspouts
F. Wheelbarrows, etc.

Also, to better understand:

A. Maintenance and Repair
B. Improved Usage, etc.

of things such as:

A. Chain-Saws
B. Mixmasters, etc.

RELATED

9. Furniture set-up person
10. Furniture assembler
11. Bed maker
12. Case framer
13. Chair assembler
14. Furniture finisher
15. Finish carpenter
16. Framing carpenter
17. Roofers
18. Plastic laminators
19. Kitchen cabiner makers
20. Paneling and trimmers
21. Pattern makers
22. Plant foreman
23. Model makers
24. Interior designers
25. Wood teachers
26. Forresters
27. Wood technologists
28. Wood products engineer
29. Wood products scientist
30. Boxing technicians
31. Furniture designers
32. Hardware manufacturers
33. Wood tool manufacturers, etc.

B. Technical Illustrator Related:

1. Advertising
2. Catalogue illustration
3. Operations/maintenance illustration
4. Piping/wiring installation illustration
5. Architectural/engineering illustration
6. Textbook illustration
7. Patent illustration
8. Production illustration

AREA CONTENT	LEVELS: COURSE I	II	III	IV	GRADE K/6	5/9	9/12	GOALS --- WORK
XXXV WOOD- FURNITURE/CABINETRY, cont'd		X	X	X			X	D. Laminates (Formica, etc.)
XXXVI TECHNICAL ILLUSTRATION: Combination of free-hand and instrument drawing leading to photo-simulated copy used primarily in the areas of: Design, Manufacturing, Operation, and Maintenance, and Advertising of product: A. AXONOMETRICS- All B. OBLIQUES- All C. PERSPECTIVES- All D. EXPLODED E. CUTAWAYS F. PHOTOGRAPHIC AS SOURCE G. FREE-HAND RENDITIONING H. LETTERING & NOTES I. SHADING TECHNIQUES 1. Solid Line- Parallel and radial 2. Stippling- dotting 3. Smudging- rubbing 4. Stick-ons- Zippatone, etc. 5. Air brush spraying 6. Charcoal drawing 7. Paint brush stroking 8. Screen-splashing			X	X			X	To knowledgeably depict in standardized drafting language form all items pertaining to technical illustration, (ANSI Y14.5, 1957) A. Basic Elements of Design: 1. Line 2. Shape 3. Mass B. Basic Principles of Design: 1. Proportion 2. Balance 3. Variety 4. Unity 5. Contrast C. Equipment- Material, Proper Use: 1. Air brush: use, maintenance, repair 2. Paint brushes: water and oil; applied use- upkeep 3. Inking: nibs, barrel pens, ball bearing, brush; upkeep 4. Pencils: black and white, colors, wax, water soluble 5. Paper and board stock

GENERAL for the WORLDS of :

RECREATION	LIVING	RELATED
XXXV WOOD- FURNITURE/CABINETRY, cont'd		B. Technical Illustrator Related: 9. Design illustration 10. Manufacturing illustration, etc.

	LEVELS: COURSE				GRADE			GOALS ---
AREA CONTENT	I	II	III	IV	K/6	5/9	9/12	WORK
Areas of Involvement...								
XXXVII PROBLEM SOLVING- Utilizing: 1) Knowledge, 2) Tools, 3) Materials, and 4) Processes in advanced engineering, machine, and general industrial drafting practice.			X	X			X	A thorough knowledge of the process or technique of problem solving is vital in this area of The World of Work. For each potential drafter, designer, engineer, programmer, or manager is or will be on his/her own as to providing needed solutions to involved industrial problems. Therefore, the process of problem solving (its own objective) should be spelled out in some detail:
A. KNOWLEDGE: All the learning that has taken place via Drafting I, II, and general exposure- 2 to 3 years of gained knowledge in Drafting.	X	X	X	X	X	X	X	
B. TOOLS: All the instruments, tools, and equipment of machine or other sophisticated mechanical- nature used throughout the drafting realm...the only possible exception being access to a computer.			X	X			X	The objective, i.e. the learning of the problem solving method is nothing more than a guided tour through prearranged and spontaneous teacher, as well as student-treated "obstacles" imposed upon a student. This, to cause him/her to, in Socratic terms,[1] draw from within him/herself insight and procedural directions for thought and action leading to the most functional answer(s) to the problem(s) generated by the learning experience(s) on hand.
C. MATERIALS: All software- non-tool, etc., text and research books, manuals such as ANSI industrial or pure research documents, professional and trade publications, etc. plus papers, drawings, tracings, and reproductions.			X	X			X	
D. PROCESSES: All those experientially learned methods and techniques compatible with learning and industrial application			X	X			X	Seldom in a pure learning process should there be a direct answer to a direct question. Rather, student questions ought to be answered by teacher questions. This, when properly applied, will lead the student back to his/her own experiential and pure logic processes. Teacher questions should, thus, motivate and deftly indicate direction and sub-goals ever expanding the learning process. In fact, the

[1] See Related Collumn

GENERAL for the WORLDS of :

RECREATION

Work cont'd,

teacher should take full advantage of every opportunity to engage students in this process of critical thinking. Ultimately, and usually, answers will come forth surprisingly quickly, especially when personal need enters the picture.

This learning process of judicious self-involvement, critical analysis, and some hard honest work application...resulting in positive student answers, from within, will be uniquely his/her discovery and achievement. This is altogether more meaningful and longer lasting than any direct teacher supplied answer(s).

Therefore, throughout this Mechanical Drafting III and IV area, the accent should be heavily on individual centered activity, almost and often totally independent study in nature. To further this concept through problem solving, some sub-objectives must be learned and mastered. These for the three worlds of 1) Work 2) Recreation, and 3) Living are:

1. Pre-planning,
2. Research,
3. Testing,
4. Analysis,
5. Final Solution, and
6. Teacher, Supervisor, Group, Family, Financial, etc., Approval.

LIVING

Work cont'd,

This action should involve these further sub-objectives:

1. Knowledge,
2. Learning how to learn,
3. Skills,
4. Methods,
5. Techniques,
6. Tools; proper use of,
7. Materials; proper use of,
8. Processes, and
9. Those aspects of safety which apply to the total fields of Work, Recreation, and Living, especially as identified by OSHA.

RELATED

[1] Interestingly, the Pestallozi Method of early pre-Industiral Arts days utilizes the same concept, but applies the terms in paraphrase; "From the known shall you find the knknown...from the concrete, the theory...all new learning stems from known personal experience..."

Note: Items 1-6 and 1-9 in the Recreation collumn should be assured by meaningful teacher involvement. The teacher is the catalyst through which problem solving and its sub-objectives must become reality!

GENERAL for the WORLDS of :

RECREATION	LIVING	RELATED
XXXVII PROBLEM SOLVING cont'd, Fundamental recreation requires continuous problem solving, whether inter-personal or material as pertaining to equipment and essential tools, materials, and/or processes.	Practical living requires no less expertise than do the Worlds of Work and Recreation. Problem solving here inevitably requires out and out ingenuity in attaining solutions due to the normal individual's lacking of expert tools and equipment...paper solutions cost far less than committed materials and tool blunders.	It should be noted that this curriculum frowns upon copy-work from any source as the essential ingredient in learning!

	LEVELS:						
	COURSE				GRADE		
AREA CONTENT	I	II	III	IV	K/6	5/9	9/12
Areas of Involvement...							
XXXVIII PIPE DRAWING[1] For purposes of: 1) Production, 2) Processing, 3) Transportation, 4) Utilization of fluids, i.e. liquid metals, sodium, nitrogen, oil, gasoline, ether, acids, and gases...chemical and combustion, etc., 5) For the control of manufacturing and laboratory machines and power, mechanics, flight, earth movers, lifters, scales, medical, etc., all via hydraulic and pneumatic control systems, and 6) For structural relative to columns, handrails, etc.			X	X			X
This requires proper drawing depiction as follows:							
A. DOUBLE LINE SYSTEM			X	X			X
B. SINGLE LINE SYSTEM, (Diagrammatic) as in:			X	X			X
1. Development			X	X			X
2. Pictorial- isometric and oblique			X	X			X
3. Orthographic			X	X			X
4. Size description:			X	X			X
a. dimensions							
b. pipe and fitting sizes							
c. flow direction							
5. Symbology standards			X	X			X
6. Notations, general and local			X	X			X
C. PIPING- Steel and wrought iron, cast iron, seamless brass and copper, plastic, glass, aluminum, and tubing such as copper, plastic, glass, and aluminum.			X	X			X

GOALS ---

WORK

To learn to correctly depict all Pipe Drawing forms as per ANSI requirements.

To learn as much as possible about the materials, the systems, the controls by book, manual, and direct first hand experiential involvement as time will permit. For example:

1. To know that steel and wrought iron pipe are used to transport water, steam, oil, and gas in states of high temperature and pressure.
2. To know that cast iron pipe is for low pressure transport of water, gas, sewage, and low pressure steam.
3. To know that seamless brass and copper pipe are used extensively in pulmbing to withstand corrosion.
4. To know that copper tubing is used in plumbing and heating and where vibration and misalignment are problems as in Power Mechanics, Automotives, Hydraulic and Pneumatic Systems.
5. Soft and hard plastic pipe and tubing ideal for resistance to chemical corrosion...glass, tempered conditional not good for heat and pressure.
6. Aluminum tubing and rubber hosing good for low temperature/pressure, non-corrosive exposure.
7. To know that threading will nominally be used on small diameters, 2.5 inches and less.

---

[1] ANSI Y 32.4, 1955.

GENERAL for the WORLDS of :

RECREATION

To be able to functionally use gained knowledge of total piping area relative to needs- as in satisfying the construction of:

1. *Plumbing supply lines*
2. *Plumbing waste lines*
3. *Plumbing climate control lines*

For the year-round recreational center for the local scouts, etc., or to be able to design correctly posts and railings as well as construct the unit(s) on the stairs leading to the recreational center, or to be able to utilize plastic, rubber, or composition flexible tubing...correctly for power/cleaning, etc. purposes at the recreational center; or the expertise to use all or only the affected areas of piping for applied use in recreational:

1. *Boating*
2. *Aircraft*
3. *Vehicular*
4. *Trampoline*
5. *Vine Structures*
6. *Swings, etc.*

LIVING

To have gained sufficient expertise in piping to adapt it for daily-living use, as for house plumbing, planning, maintenance, and repair; or for automobile, lawn-mower tubing, hosing, exhaust pipe/manifold- muffler maintenance and repair; or to plan, construct, maintain, and repair the roof-gutter drainage system.

Generally, anything in the daily-living category, usually home centered, dealing with:

1. *Piping*
2. *Tubing*
3. *Hosing*
4. *Valving*
5. *Ducting*
6. *Water supply*
7. *Sewage- external and internal/ house*
8. *Air conditioning*
9. *Heating*
10. *Humidifying (dehumidifying also)*
11. *Electrical conduit*
12. *Fuel lines*
13. *Flue lines*
14. *Exhuast systems*
15. *Vacuum systems*
16. *Lubrication*
17. *Hydraulics*
18. *Dryers/washers*
19. *Most home-centered power mechanic portable and vehicular systems, etc.*

RELATED

Career identification can be furthered in this area of Piping as follows:

1. *Chemical Engineering*
2. *Structural Engineering*
3. *Metallurgical Engineering*
4. *Mechanical Engineering*
5. *Designing*
6. *Drafting*
7. *Plumbing*
8. *Climate-Control*
9. *Solar Energy*
10. *Garage Repairer*
11. *Boat/ship technicians*
12. *Auto Mechanics*
13. *Aircraft Mechanics*
14. *Electrician*
15. *Chemist*
16. *Metallurgist*
17. *Plastic technologist*
18. *Ecological technologist*
19. *Carpenter*
20. *Contractor*
21. *Mason*
22. *Machinist*
23. *Pipe technician*
24. *Welder*
25. *Foundry*
26. *Pattern maker*
27. *Hydraulic/pneumatic technician*
28. *Custodian*
29. *Building Superintendent*
30. *Landscape Contractor*
31. *Structural Contractor*
32. *Distillary Operator, etc.*

AREA CONTENT	LEVELS: COURSE I	II	III	IV	GRADE K/6	5/9	9/12	GOALS --- WORK
Areas of Involvement...								
XXXVIII PIPE DRAWING, cont'd			X	X			X	8. To know that welding implies gas, arc, or MIG/TIG, although brazing and soldering also, sweating are welding terms
D. JOINTS- Threaded, welded, hot lead, soldered, flanged, flared, pressure gasket-rubber/plastic (friction)			X	X			X	9. To know that hot lead means Oakum Packing and caulked liquid lead (Hot)
E. VALVES-			X	X			X	
1. Gate- fluid flow, heavy duty, not close control			X	X			X	10. To know that flanges can be cast as one piece with pipe or added as a friction or threaded collar...plus gasket.
2. Globe- fluids and gases, fine control where air, steam, gas, and other compressibles are precisely regulated.			X	X			X	11. To know that flaring is normally applied to small diameter tubing...copper, aluminum, soft steel- also, some plastics and glass.
3. Check- one directional flow only- operated by internal pressure and line flow.			X	X			X	
F. FITTINGS- Directional Control:			X	X			X	12. To know as much about valving as possible, i.e.: a. Design b. Composition c. Sizes d. Availability e. Application f. Use G. Maintenance h. Longevity, etc. This to properly design any system of piping with regulatory controls.
1. Reducers			X	X			X	
2. Elbows/Bends			X	X			X	
3. Tees			X	X			X	
4. Crosses			X	X			X	
5. Laterals			X	X			X	
6. Eccentrics/Concentrics			X	X			X	
7. Flanges (Plates)			X	X			X	
8. Caps/Plugs			X	X			X	
9. Couplings			X	X			X	
10. Nipples			X	X			X	
11. Bushings			X	X			X	
12. Unions			X	X			X	
13. Safety (Blow-off device)			X	X			X	13. To know as much about fittings as possible to again, design as well as possible...note that the above a) through i) should also be applied here.

GENERAL for the WORLDS of :

RECREATION	LIVING	RELATED
Information on pages 7 and 8 apply here as well.	Information on pages 7 and 8 apply here as well.	Information on pages 7 and 8 apply here as well.

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AREA CONTENT	LEVELS:							GOALS --- WORK
	COURSE				GRADE			
	I	II	III	IV	K/6	5/9	9/12	
Areas of Involvement...								
XXXVIII PIPE DRAWING," cont'd			X	X			X	14. To know what constitutes safety in relation to piping, storage, heat, pressure, fuses, breakers, pressure release valves, compression chambers, etc.
IXL CAMS- Are irregular-shaped discs (also disks) or cylinders mounted on shafts which revolve and change rotary motion into irregular reciprocating motion, either perpendicular to or parallel to axis of shaft through sliding contact with followers			X	X			X	To knowledgeably depict in standardized (ANSI) drafting language: 1. Displacement Diagrams of the "Curve" of the follower travel through successive units of time of one cam rotation.
A. DISC CAMS BREAKDOWN AS FOLLOWS: 1. Radial 2. Face 3. TOE and Wiper 4. Yoke 5. Combo-Drum and Plate 6. Conjugate			X	X			X	2. Plotting of follower(s) perpendicular or parallel to axis(es) of cam and its shaft(s) and drawing appropriate connecting lines to reveal follower travel in terms of: a) Placement b) Main Center Lines c) Cam Shaft Circle
B. CYLINDRICAL CAMS BREAKDOWN AS FOLLOWS: 1. Groove 2. End 3. Barrel (drum) 4. Index			X	X			X	d) Cam Shaft Key e) Hub Circle f) Radial Lines (Angle of Action) g) Maximum Follower Rise h) Follower Position Circles (12 or compatible with radial angles) i) Follower Positions
C. FOLLOWERS FOR CAMS BREAKDOWN AS: 1. Pointed 2. Knife 3. Flat Face 4. Roller: a) straight b) taper			X	X			X	j) Pitch Curve k) Edge Working Surface l) Follower, Roller or Direct m) Sectional Details of Cam and Follower(s) n) Plotting for Linear Cylindrical

GENERAL for the WORLDS of :

RECREATION	LIVING	RELATED
To utilize the concept of cam regulation of irregular motion control for recreational purposes, i.e., controlled water delivery to vacation or scouting building- from running stream via paddle wheel and planned cam(s) plus follower attachments- or windmill power and subsequent cam and follower attachments- or whatever innovation an existing cam-controlled unit can accept relative to improved action, single to multiple action(s), more fluid acceleration, better dwell and shut-off as well as start, etc.	To utilize the gained knowledge for daily-life application- decidedly better consumer application to: research, shopping, purchase, use, maintenance, and repair of anything involving cam-action such as: 1. Power Mechanics Engines 2. Sewing Machines 3. Belt-shifting Devices 4. Jig-clamping Devices, etc.	Career identification can be furthered in this area of Cams as follows: 1. Mechanical Engineering 2. Machine Designing 3. Machine Drafting 4. Machine Detailing 5. Shop Administration 6. Master Mechanic/Trouble Shooting 7. Machinist 8. Tool, Die and Jigs- Making 9. Engine Mechanic- a) Aircraft b) Automobile c) Truck d) Tractor e) Boat f) Ship g) Snowmobile h) Sewing Machine i) Printing Press j) Textile Machine k) Stamping Machine l) Feed Mechanisms m) Turbines n) Reciprocating Steam Engines, etc.

AREA CONTENT	LEVELS: COURSE I	II	III	IV	GRADE K/6	5/9	9/12	GOALS --- WORK
Areas of Involvement...								
IXL. *CAMS, cont'd*								
C. *FOLLOWERS FOR CAMS BREAKDOWN , cont'd*			X	X			X	3. *To gain working knowledge of cam motions as follows:*
4. **Roller:** c) *swinging* d) *dual, radial* e) *closed* f) *index, turret* g) *spring loaded conjugate* h) *swing arm dual*								a) *Uniform* b) *Parabolic* c) *Harmonic* d) *Cycloidal* e) *Modified Sine* f) *Modified Trapezoid* g) *Synthesized Modified Sine-Harmonic*
								4. *To learn cam-shop terminologies.*
XL *MECHANICAL POWER TRANSMISSION is composed of machine elements which are used to transmit motion and power, this, from a rotary source to a rotary receiver. This is done on both parallel and divergent axes, as well as rotary to linear and vice versa. This action is implemented in three different ways: 1) Belt and Pulley, 2) Chain and Sprocket, and 3) Gearing.*			X	X			X	
A. *BELT AND PULLEY SYSTEMS:*			X	X			X	
1. *Open Drive*			X	X			X	
2. *Open Drive Plus Idler*			X	X			X	
a) *Slack, in, Driver* b) *Slack, out, Driver* c) *Tight, in, Driven* d) *Tight, out, Driven*								

GENERAL for the WORLDS of :

RECREATION

To be able to use the Belt Pulley System for recreational enjoyment where it is possible. It is the least expensive Mechanical Power Transmission System. This could be for providing power (motion) for mechanical operations at the vacation shack as per:

1. Transportation of wood
2. Compressor Operation
3. Saw (Cutting) Operation
4. Pumping Operation, etc.

LIVING

To utilize this gained knowledge for daily-living purposes as in more critical and functional consumerism.

Also, for such obvious things as improved car maintenance for all Pulley/Belt Components. The same for:

1. Sump Pump
2. Deep or Shallow Well Pump(s)
3. Air Compressor for Painting or Tire Pressure
4. Household Washer Operation
5. Household Dryer Tumbling and General Operation

RELATED

Career identification can be furthered in this area of Mechanical Power Transmission as follows:

1. Machinists
2. Jig, Tool and Die Makers
3. Power-Train Specialists
4. Gear Cutting Specialists
5. Layout Person
6. Set-up Person
7. Bearing Specialists
8. Machine Designers
9. Cam Specialists
10. Engine Designers
11. Engine Maintenance Specialists
12. Engine Repair
13. Engine Mechanics
14. Bench Mechanics
15. Quality Controller
16. Heat Treaters
17. Plating Specialists
18. Sandblasters

AREA CONTENT	LEVELS: COURSE I	II	III	IV	GRADE K/6	5/9	9/12
A. BELT AND PULLEY SYSTEMS, cont'd			X	X			X
3. Cross Belt Drive			X	X			X
4. 1/4 Twist Drive			X	X			X
5. 1/4 Twist Drive and Idlers			X	X			X
6. Increasing Power			X	X			X
7. Increasing Speed			X	X			X
8. Detail of Cross Section of Belt/Pulley(s)			X	X			X
9. Dimensions							
10. Notes- Local and General							

GOALS --- WORK

To knowledgeably depict in standardized drafting language (ANSI) items XXXVIV, A, 1-10, in Area Content Column at left.

In addition, the following items must become first-hand knowledge if Drafting is to correctly occur:

1. Pulleys- Flat with Crown, Flat Uncrowned, Flat with Grooves (Ribbed-Sheaves), Flat-Positive Drive (Timing), Flat-Positive Drive with Flange, also Vee with Single Drive, Vee with Double Drive, also, the amount of crown.

2. Belts- Composition of:

   a) Flat- Leather, rubber, fabric, rubber cord, non-reinforced rubber, non-reinforced plastic, reinforced leather, and fabric.

   b) Vee- Industrial heavy-duty, industrial light-duty, agricultural, automotive

3. Motor Mounts- Sliding, Cradle, Spring Tension, and Pivoted

4. Areas of Applied Use:

   a) Light
   b) Normal
   c) Heavy-Duty

5. Proper Use of Tables for:

   a) Calculating pulley diameter of driver shaft and belt cross section
   b) Calculating R.P.M. and diameter of driven belt
   c) Determining V-Belt length from pulley diameter and center distances

GENERAL for the WORLDS of :

RECREATION

Also, to better use and maintain:

1. Snowmobile Movement
2. Race Car and Dragster cooling generating, timing, and turbocharging operations
3. To plan and construct a small ski-chair lift system.
4. To establish vacation shack central-ceiling cooling fan, etc.

LIVING

6. Household Dishwasher
7. All Large Multiple Piece Blowers and Fans
8. Oil Burner Operation
9. Furnace Blower Operation
10. Slicers
11. Stand-by Generator
12. Drill Press
13. Speed-up Drives
14. Refrigerators
15. Grinder, etc.

RELATED

19. Metallurgists
20. Research Analysts
21. Belt Specialists
22. Sprocket and Chain Specialists
23. Foundry Person
24. Physicists
25. Programmers
26. N.C. Operators
27. Computer-assisted Designers
28. Power-Train Supervisor, etc.

	LEVELS:							GOALS ---
AREA CONTENT	COURSE				GRADE			WORK
	I	II	III	IV	K/6	5/9	9/12	
XL MECHANICAL POWER TRANSMISSION, cont'd								
B. CHAIN AND SPROCKET SYSTEMS:			X	X			X	To knowledgeably depict in standardized (ANSI) drafting-language form items XXXVIV, B, 1-8 in Area Content Column at left. In addition, the following items must become first-hand knowledge if Drafting is to correctly occur: 1. Sprockets- Mounted on Flanges, Hubs, Shafts, etc. a) Types- Plate, Hub; small, medium, large, Double, Split-type, Double-duty type, Shear-Pin Type, Slip-Clutch Type. 2. Chains- (Steel, Machined, Forged, and cast) a) Types- Detachable, Pintle, Offset, sidebar, Roller, Double Pitch, Inverted-Tooth, Silent, Bead or Slider 3. Motor Mounts- Adjustable 4. Areas of Applied Use: a) Light b) Normal c) Heavy-duty
1. Adjustable Sprocket Center Drive			X	X			X	
2. Idler Sprocket Adjustment Drive			X	X			X	
3. Multiple Driven Idler Adjustment Drive			X	X			X	
4. Long Center Distance Drive			X	X			X	
5. Long Center Distance with Counter' Shaft(s) Drive			X	X			X	
6. Detail of Cross Section of Chain/Sprocket			X	X			X	
7. Dimensions								
8. Notes- Local and General								

GENERAL for the WORLDS of :

RECREATION

To be able to use the Chain Sprocket System for recreational enjoyment where possible. Greater sophistication might warrant this system in place of the Belt Pulley Unit(s) since this system has no slippage or creeping and is long-lasting. No similar off-sets to parallel shafting as in Belt and Pulley can occur, however.

Also, to be knowledgeable in the following:

1. Bicycle Drives
2. Automobile Timing Devices
3. Automobile Cam-Shaft Controls
4. Motorcycle Drives
5. Snowmobile Power Connections
6. Home Workshop Lathe, Metal, etc.

LIVING

To use this gained knowledge for daily-living purposes as in more critical and functional consumerism.

Also, to replace Belt and Pulley Systems where possible and desirable.

To further use the gained knowledge for the proper maintenance and repair of any sprocket/chain-contained systems in daily-living use, such as on:

1. Bicycles
2. Automobiles
3. Motorcycles
4. Lawnmowers
5. Sewing Machines
6. Power Chain Saws
7. Wrench Applications, etc.

RELATED

For Career Identification, see XXXVIV, Part A, Belt and Pulley Systems, Related Column (pages 103, 105).

	LEVELS:							GOALS ———
AREA CONTENT	COURSE				GRADE			WORK
	I	II	III	IV	K/6	5/9	9/12	
XL MECHANICAL POWER TRANSMISSION, cont'd			X	X			X	5. Such Design Information as: a) Average H.P. to be transmitted b) RTM of driver and driven c) Shaft diameter d) Permissable sprocket diameters e) Load characteristics f) Lubrication g) Life expectancy 6. Ability to read and interpret tables and data charts 7. Fastening via Key/Key-ways
C. GEARING- Systems Breakdown: a) Display or Presentation and/or b) Working Drawing Forms as follows: 1. Spur- Circular, Straight Teeth, Parallel Shafts, Speed Same or Variable. 2. Rack- Linear, Spur Teeth, Transforms Rotary to Straight-line Motion. 3. Ring- Internal Spur 4. Bevel- Circular Cone, Right Angle, Intersecting Shafts understated, Straight Teeth, Variable Speed								To knowledgeably depict in standardized (ANSI) drafting-language form items XXXVIV, C, 1-15, in Area Content Column at left. In addition, the following items must become first-hand knowledge if drafting is to correctly occur: 1. Job Parameters: a) Knowledge about Involute Grom b) Gearing design requirements for job c) Strength requirements for job d) Probable wear to be encountered e) Degree of accuracy required f) Heat treating needs for job

GENERAL for the WORLDS of :

RECREATION	LIVING	RELATED
To be able to use Gearing for recreational enjoyment where possible. Greater affluence might influence gearing replacement of both Belt and Chain Drive Systems for reasons such as: 1. Excellent (Improved) Control 2. More Variable and Greater Speeds 3. More Positive and Reliable Power 4. Less Wear in System and thus greater Longevity	To utilize gained Gearing knowledge for daily-living purposes as in more critical and functional consumerism. For example— research and smarter purchasing of items such as: 1. Can openers 2. Automatic carving knives 3. Shavers 4. Hair cutters 5. Multi-purpose pumps 6. Sewing machines, etc.	Career Identification as per Chain and Sprocket, Belt and Pulley Systems...generally. However, some additions can be made here: 1. Power-Transmission Specification Writers 2. Power-Transmission Industrial Illustrators 3. Power-Transmission Related Authors 4. Power-Transmission Related, e.g. Automotive, Power-Mechanic, Machine Shop, etc., Teachers 5. Power-Transmission Trouble-Shooters 6. Power-Transmission Related Salespeople, etc.

	LEVELS:							GOALS ---
	COURSE				GRADE			
AREA CONTENT	I	II	III	IV	K/6	5/9	9/12	WORK
XL MECHANICAL POWER TRANSMISSION, cont'd C. GEARING, cont'd 5. Angle- Circular Cone, Variable Angle Intersecting Shafts, Variable Speed, Straight Teeth 6. Miter- Circular Cone, Right Angle Intersecting Shafts, Teeth on Angle or Parallel to Shaft, Same Speed 7. Helical- Circular, Angle Teeth, Non-Intersecting Shafts, Variable Speed 8. Worm- Screw-thread like Teeth, Single to Quadruple Lead, Right Angle Non-Intersecting Shafts, High-Ratio Speed Reduction = Driver 9. Worm Wheel- Circular, Spur-like, Non-Intersecting Shafts at Right Angle, High-Ratio Speed Reduction = Driven Unit 10. Pinion- Small Geared Unit, Meshing with Large Wheels = Driver (Not Driven) 11. Tooth-Cutting Data- 7 to 10 required items			X	X			X	To knowledgeably depict in standardized (ANSI) drafting-language form items XXXVIV, C, 1-15 in Area Content Column at left. In addition, the following items must become first-hand knowledge if drafting is to correctly occur, cont'd- 2. Normal Tooth Cutting Gear Data: a) Number of teeth b) Diametral Pitch c) Pressure Angle d) Pitch Diameter e) Circular thickness f) Whole Depth g) Working Depth h) Chordal Addendum i) Chordal thickness 3. Differences between: a) Involute and b) Cycloidal Curves 4. Use of Grant's Involute Odontograph 5. Differences in Basic Racks 14 1/2° Composite and 20° Stub Involute Systems 6. Key/Key-way Shaft Application

GENERAL for the WORLDS of :

RECREATION

These improvements could then be applied to things such as:

1. Hobby-Shop, Metal and Wood Lathes
2. Hobby-Shop Metal Shaper
3. Vacation Home or Recreation Center Water Pump
4. Same for Ventillation Fans
5. Same for Alternate Power Generator
6. Same for Multi-use Power Transmission Unit for Positively- Controlled Variable Speed/Power, etc.

LIVING

Also, to replace both Belt and Chain Drive Systems where possible and desirable, such as in:

1. Alternate Power Generators
2. Pumps- Multi-Purpose
3. Stokers
4. Heavy-duty Exhaust Fans
5. Pressure Generators, etc.

Also, to further use the gained knowledge for the proper (improved) use of and correct maintenance of any every-day living device dependent on Gearing for power transmission such as:

1. Automobiles
2. Motorcycles
3. Boats
4. Sewing Machines
5. Lawn Mowers
6. Tractors
7. Shavers
8. Hair Cutters
9. Can Openers
10. Mixers, etc.

RELATED

	LEVELS:							GOALS ———
AREA CONTENT	COURSE				GRADE			WORK
	I	II	III	IV	K/6	5/9	9/12	
C. GEARING, cont'd			X	X			X	7. Standard Gearing Terminology: a) Pitch Circle b) Pitch Diameter c) Addendum d) Addendum Circle e) Dedendum f) Root Circle g) Root Diameter h) Base Cricle i) Pressure Angle j) Circular Pitch k) Whole Depth l) Working Depth m) Clearance n) Circular Thickness o) Chordal Thickness p) Chordal Addendum q) Number of Teeth r) Diametral Pitch s) Pitch Angle t) Face u) Face Angle v) Mounting Distance w) Root Angle x) Crown Backing y) Crown Height z) Ratio aa) Hub Diameter bb) Hub Projection cc) Back Angle dd) Pitch Apex ee) Mounting Distance ff) Hole Length gg) Limit-point Width hh) Tool-Edge Rad ii) Back Lash jj) Axial Pitch kk) Lead Angle ll) Lead RH, LH mm) Normal Pressure nn) Face Radius oo) RIM Radius pp) Face qq) Throat Diameter rr) Center Distance ss) Spiral Angle tt) Shaft Angle
12. ANSI Required Dimensions								
13. Notes- Local and General								
14. Tooth Profile or Non-layout								
15. Detail Cross Section of Profile or Non-Profile Tooth Unit								

GENERAL for the WORLDS of : 113

RECREATION	LIVING	RELATED
287		288

Curriculum Implementation

Section B - Architectural Drawing

AREA CONTENT	LEVELS: COURSE I	II	III	IV	GRADE K/6	5/9	9/12	GOALS — — — WORK
I. ARCHITECTURE: HISTORY OF								
A. PREHISTORIC PERIOD	X	X					X	A thorough knowledge of the prehistoric era of the history of architecture is essential. This to the understanding of what historically follows as the evolvement of its historical styles.
1. Hunters and Fishermen a) Rocks b) Caves								
2. Tillers of Soil a) Huts 1. Trees and brush 2. Leaves 3. Straw and hay 4. Mud 5. Dung	X	X					X	Architecture, in this light, becomes understandable as man's utilization of any and all naturally evolved shelters suitable for his use; caves, caverns, rocks. As man became more social and less satisfied with animal shelters, he also became more proficient. He began developing tools, crude but usable, therefore, man-made shelters evolved. Still evident in many parts of the world are huts. For these he used whatever the area of habitation provided. This era was was followed by the nomad and his tents.
3. Nomads a) Wanderers b) Merchants- early c) Shepherds d) Warriors e) Tents as shelter 1. Animal skins 2. Cloth	X	X					X	Throughout all of this time, the major instigators for self-preservation were: weather, wild beasts, snakes and birds, and human foraging.
4. Motivators (Influencing Forces) a) Weather b) Wild beasts c) Human foraging	X	X					X	Goals here would be realistic, accepting the present status quo as an established and known base from which excursions for improvements can occur. Therefore, the following are given: Learning to: 1. Be Realistic 2. Be Practical 3. Be Ingenious 4. Develop Foresight

GENERAL for the WORLDS of :

RECREATION

A knowledge of prehistoric shelters can be useful whenever one is camping or when forced to take shelter for whatever reasons, i.e. when trapping, hunting, berrying, or gardening and a sudden downpour, or a snowstorm, etc. occurs. Thus, the following could be advantageous...

Learning to:
1. Make a Lean-to
2. Identify Shelter Materials- boughs, branches, leaves, hay, straw, brush, clothing, stones, boards.
3. Set Up a Tent
4. Seek out Natural Overhang
5. Seek out a Cave, Cavern
6. Seek out Appropriate Tree Shelter
7. Properly use Earth Via Excavating- Trench Dugout Hut, Sodded, etc.
8. Permanent Camps, using logs, lumber, stone, metals, plastics, cloth, glass, etc., and mobile structures.

In short, emergency shelter necessities when involved in out-of-door recreation.

LIVING

The utilization of early man-functional shelter items, i.e. ideas, techniques, and/or materials for present-day applied use. For the modern-day home owner and prospective buyer, this could be familiarization with early-man methods and materials and their relative success in performing their allotted functions.

This, then to be used as a measuring stick for today's houses, construction materials, methods of building, fastening of building items, longevity of building materials, their composition, their effect on man, his protection and comfort, etc.

Specifically, this could be spelled-out as functional knowledge about things such as:

1. Stone- kinds, strength, longevity, appearance
2. Woods- kinds, strength, longevity, appearance
3. Mortar- composition, application, longevity, appearance
4. Roofing- composition, application, longevity, appearance
5. Protection from weather
6. Protection from animal and insect life (e.g. adequate perimeter protection against infiltration of snakes, rodents, carpenter ants, bees, termites, etc.)

RELATED

Note: This is the one area in education where adequate consumer knowledge can occur re his housing.

Also, the early identification of career activities such as:

1. Archeologists
2. Forestry Allied
3. Geologists
4. Research
5. Physicists
6. Contractors; building/landscape
7. Carpentry
8. Masonry
9. Recreation Shelters- building of
10. Salesmen for Autos, trailers, building materials, real estate, etc.
11. Wildlife Management, etc.

	LEVELS:							GOALS ---
	COURSE				GRADE			
AREA CONTENT	I	II	III	IV	K/6	5/9	9/12	WORK
I. ARCHITECTURE: HISTORY OF, cont'd								5. Properly Plan 6. Accept Adversity 7. Improve Anything 8. Work Cooperatively 9. Accept Authority 10. Be Appreciative 11. Learn From History, etc.

GENERAL for the WORLDS of :

RECREATION	LIVING	RELATED
	7. Fastening Agents- gravity, interlock, pegs, metals, etc. 8. Effect of Geography- hill valley, plain, soil, water level, etc. 9. Relative Comfort Derived from Structures, Materials and Placement 10. Early Nomadic Experiences Updated and Applied to modern trailers, tents, pop-ups, commercial facilities; whether land, sea, or air travel, etc.	

AREA CONTENT	LEVELS:							GOALS ---
	COURSE				GRADE			WORK
	I	II	III	IV	K/6	5/9	9/12	
I. ARCHITECTURE, HISTORY OF, cont'd								
B. HISTORICAL STYLES	X	X					X	A comprehensive knowledge of this era of architecture ought to be required for the serious students, i.e., future architects and architectural designers. It should also be studied by other students, not architecture-bound, but with less emphasis. Our so-called modern systems find their origins in these formalized architectural beginnings. Any in-depth study will show the interrelationship of influences compatible with all time eras. These influences should be learned to use as practical (tools) in the study and understanding of any architecture. These are: 1. Geography 2. Climate 3. Society 4. Geology 5. Religion 6. History 7. Function 8. Technology (of the time) A further breakdown once the above parameters have isolated the structures into simple implements of construction would be as follows: 1. Plans 2. Walls and Footings/Supports 3. Openings- Lintel Design Arches 4. Roofs- Support, Spans 5. Columns/Support for 6. Mouldings 7. Ornamentation
1. Egyptian	X	X					X	
2. West Asiatic	X	X					X	
a) Plains of Tigre and Euphrates								
b) Chaldea								
c) Mesopotania								
d) Babylon								
e) Assyria								
f) Persia								
g) Selevoid								
h) Saracenic								
i) Jewish Influence								
j) Phoenicians								
3. Greek	X	X					X	
4. Roman	X	X					X	
5. Early Christian	X	X					X	
6. Byzantine	X	X					X	
7. Romanesque in Europe	X	X					X	
a) Italian								
b) French								
c) German								
8. Gothic in Europe	X	X					X	
a) English- Medieval								
b) Scottish								
c) Irish								
d) French								
e) Belgian and Dutch								
f) German								
g) Italian								
h) Spanish								
9. Moorish Influence upon civilized world of the time.	X	X					X	

GENERAL for the WORLDS of :

RECREATION

A knowledge of the structures of the historical era of architecture can be beneficial for hoboyists making scaled models of structures for pure enjoyment or for gifts.

In another vein, a knowledge of applied methods, techniques, practices, and materials should considerably enhance any camping, enforced, or pure enjoyable. This, by applying the above to:

1. Available building materials
2. Post and Beam Technique
3. Lintel Technique
4. Raised flooring
5. Water control
6. Wall durability
7. Roofing re needs
8. "Prettying-up" esthetics
9. Heat source
10. Smoke removal
11. Window coverage
12. Door requirements
13. Waste processing
14. Light source, etc.

LIVING

The knowledge gained by a study of the historical era should create better consumers of houses. Building techniques, methods, and materials can better be appraised as to their worth and functionality. Thus, an objective analysis can be arrived at as to the contractors plans. His work, and results...in like manner any existing dwelling can be similarly analyzed as to worth-whileness in part or in whole, i.e., flooring, footing, foundations, walls, ceilings, roofing, partitions, opening framing, chimneys, flashing, stairs, etc. as well as decoration and design application.

Also, similarly a knowledge concerning design and structure would provide the required expertise to intelligently purchase small-scale period housing, furnishings (large or small), etc. for child gifts or collectors items.

Some functional knowledge applications to daily living could thus well be:

1. Appreciation of other cultures and their products
2. Improved consumer knowledge implementation
3. Awareness of architecture for geography re climate, weather, and local "home-grown" products.
4. Zoning- compatible neighborhood architecture.
5. Building codes- parameters of building implementation re structure and safety

RELATED

The historical styles architectural period study can definitely inspire as well as plant the seed for future growth in architecture-related areas. Therefore, early career identification is possible, and in fact, is desirable in view of the length of time too often required in gaining essential expertise so as to be useful in our society. Such career identification would be as follows:

1. Historians
2. Architects
3. Architectural Designers
4. Furniture and Cabinet Designers and Builders
5. Contractors- general
6. Carpenters
7. Masons
8. Stone Cutters
9. Painters- residential
10. Roofers
11. Plumbers
12. Climate Control
13. Electricians
14. Glazers
15. Surveyors
16. Landscapers
17. Artists
18. Model Makers
19. Salesmen
20. Decorators
21. Product Designers
22. Archeologists, etc.

AREA CONTENT	LEVELS:						
	COURSE				GRADE		
	I	II	III	IV	K/6	5/9	9/12
I. ARCHITECTURE; HISTORY OF, cont'd	X	X					X
B. HISTORICAL STYLES	X	X					X
10. Renaissance, Europe	X	X					X
a) Italian							
b) French							
c) German							
d) Belgian/Dutch							
e) Spanish							
f) English							
11. Modern	X	X					X
a) English							
b) Dominions of England							
c) U.S.A.							
d) Western Hemisphere, other							
e) European, Balance							
f) Far Eastern, other							
g) African							
C. THE NON-HISTORICAL STYLES*	X	X					X
1. Indian (Far East, Original)	X	X					X
2. Chinese	X	X					X
3. Japanese	X	X					X
4. Indo-Chinese	X	X					X
5. Saracenic- Moorish Influence	X	X					X
a) Arabia							
b) Persia							
c) Syria							
d) Spain							
e) Turkey							
f) India							
6. Western Hemisphere (Pre 1800)	X	X					X
a) Incas							
b) Aztecs							

GOALS --- WORK

These then, are the tools with which any comparative analysis can be made. This latter is vital for the World of Work. The use of these tools leading to fast accurate applications will assure successful competitiveness in the marketplace. Thus, the following should be nurtured:

1. Open-mindedness- Objectivity
2. Critical Thinking
3. Spatial Consciousness
4. Realism
5. Appreciation of Esthetics
6. Time Consciousness, etc.

Also, the knowledges, techniques, and processes as they would apply to new materials and their utilization. These would be:

1. Steels and Alloys
2. Aluminum and Alloys
3. Plating, i.e., chrome, zinc, etc.
4. Riveting
5. Welding
6. Plastics
7. Insulating Glass
8. Insulation
9. New Ceramics
10. Spraying as in painting, plaster, stucco, roofing, etc.
11. Other new technological advances

The non-historical styles would be similarly interpreted as are the historical styles up to but not including the Modern Unit, B-11, above.

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* Bannister'

GENERAL for the WORLDS of :

RECREATION	LIVING	RELATED
	6. Real estate taxes- house and property evaluation 7. Health codes- water use, source, and waste disposal, etc.	
Also, the advent of new materials, methods, and application technology and its modern products implemented for worthwhile leisure-time use.	The advent of new technology affects every-day living with its new products, creations, and usages. A better informed consumer would make better use of the following: 1. Insulation application (good) 2. House moisture content control 3. Inclusive climate control 4. Planned plumbing 5. Newer electrical circuitry and fixtures 6. Original or new insulation glass 7. Respect for ecology and maintenance 8. Proper orientation and use of sun, trees, land, etc. 9. Framing members 10. Wall and ceiling covering 11. Roofing 12. Cellar 13. Insect control 14. Landscaping- proper growth in proper place, etc.	New products and technologies could lead to additional career identification for students as follows: 1. Structural Engineering 2. Steel Fabricators 3. Steel Construction Workers 4. Metallurgy 5. Chemistry 6. Composition Fabrication 7. Insulation Materials 8. Climate Control (New) 9. Solar Energy 10. Ecological Engineering 11. Wind Power 12. Garbage Reclamation, etc.
Applied use of non-historical styles in America could result in planned vacation trips to the lands of the Incas, Aztecs, or Pueblos...the Grand Canyon, etc.	Applied use of non-historical styles knowledge in daily living could lead to utilization of Indian and early settler products and practices, i.e., wearing	

	LEVELS:							GOALS ———
AREA CONTENT	COURSE				GRADE			WORK
	I	II	III	IV	K/6	5/9	9/12	
I. ARCHITECTURE, HISTORY OF, cont'd								
C. NON-HISTORICAL STYLES	X	X					X	
6. Western Hemisphere, cont'd	X	X					X	
c) Pueblos								
d) Early Settler Influences								
1. English								
2. Dutch								
3. French								
4. Spanish								
D. CONTRIBUTING INFLUENCES	X	X					X	It is essential to have some knowledge of these contributing influences to man's first crude attempts at providing shelter.
1. Weather	X	X					X	
2. Wild Animals	X	X					X	
3. Foraging Humans	X	X					X	The crudest of shelters have evolved into today's highly sophisticated dwellings complete with the latest of creature comforts. If sufficiently affluent and if money can buy it, he will have it. Whether it be self-realization, or the realization of total comfort, man seeking ever to improve his state will endeavor to achieve this. This is man's constant striving to improve his standard of living.
4. Indigenous Materials	X	X					X	
a) Stone								
b) Clay								
c) Lumber (trees)								
d) Hay (grass)								
e) Metal ore and coal								
5. Trade and Travel	X	X					X	
6. Government	X	X					X	
a) Transportation- land routes								
b) Transportation- waterways								This kind of history and the resultants should be adaptable to today's world of work goals regarding architectural commitment. Knowledge, methods, and means for improvement of research, design, manufacturing of materials, their processing into products ever more suitable for construction and functional utilization will lead to what Frank Lloyd Wright defined as
c) Discovery and development of navigation								
7. Urbanization	X	X					X	
a) Craftsmanship								
b) Guilds								
c) Fortifications for protection								

Continued on page 124

GENERAL for the WORLDS of :

RECREATION

Also, better out-of-doors living while camping via Indian practices...use of tepee, wood bark, etc.

The utilization of knowledge gained from the study of the "contributing influences" could be adapted to leisure-time activities i.e., realizing the impact of, and the kinds and types of pressures exerted upon man and his evolving sense of shelter by the listed D, 1-8 items (historically, that is), such things as purchasing and/or making genuine hobby-models to-scale; also, figures, dolls, maps, games, etc., of a historical era.

This knowledge could be converted to better, safer, and more comfortable planned travel and camping. Further more, it could lead to a more responsible person...in view of man's countless past blunders, e.g., it could lead to better and more cooperative driving, flying, riding, etc., where concern for others was paramount, e.g., in stopping at rest stations, having refreshments, checking the car periodically when filling up, checking ahead as to road and traffic conditions, etc. could lead to honest

Continued on page 125

LIVING

Indian jewelry, using Indian art forms... Also, appreciation of early houses, i.e., Saltbox with its low wind resistance, Gambrel for better attic usage, Barrack Overhang for more floor space, etc.

The application of knowledge derived via D, 1-8, influences to daily life could well improve it, i.e., determine what in the "influences" historically affected man and his evolving shelter development adversely. Analyze this objectively and apply the positive results averting the negative, for example, to purchase a house in upper Vermont because one loves the winter and its sports seems ludicrous if health factors as Sinusitis, Arthritis Frostbite, etc., make living there intolerably painful. If medication will not help, a more more moderate climate should be selected. Likewise, unless heating fuel is plentiful and affordable, the same moderating choice should be made. The same, also, applies to self-sufficiency via farming...to live on a rock ledge atop a mountain because of the view, breathtaking or not, makes little sense if starvation is the outcome, particularly when access right-of-ways and stores are literally leagues away...similarly, building in the

Continued on page 125

RELATED

Please note that pages 3, 4, and 6 of this unit, The History of Architecture, have already covered this area quite thoroughly. New career identification for students would be:

1. *Meteorology Affliated*
2. *Agriculture Affiliated*
3. *Hunting Affiliated*
4. *Fishing Affiliated*
5. *Merchant Affiliated*
6. *Medicine Affiliated*
7. *Travel Agent*
8. *Air Travel*
9. *Land Travel*
10. *Sea Travel*
11. *Mechanical Services*
12. *Security Systems*
13. *Religion*
14. *Locksmithing*
15. *City Planning*
16. *Public Service*
17. *Industrial Complex*
18. *Military*
19. *Law Enforcement, etc.*

AREA CONTENT	LEVELS: COURSE				GRADE			GOALS --- WORK
	I	II	III	IV	K/6	5/9	9/12	
I. ARCHITECTURE, HISTORY OF, cont'd	X	X					X	Organic Architecture. This would be a true and totally compatible merging of man and his needs with nature via the site through his dwelling. The following are posed:
D. CONTRIBUTING INFLUENCES	X	X					X	1. Appreciation of history as a research source.
7. Urbanization, cont'd d) Worship- organized religion- churches e) Seat of Government- Ruling Class to politicians f) Industrial Revolution g) Marketplace- stores h) Residential i) Public buildings- office buildings, libraries, schools, loading areas... j) Cemeteries- memorials	X	X					X	2. Understand how the contributing influences have affected architecture (man and his dwelling). 3. How to adapt man's needs to any of the contributing influences. 4. How to improve man through his environment.
8. Wars and Peace	X	X					X	

RECREATION

enjoyment and no littering of roadways or pollution of streams, folliage, and ground by hasty enforced relievals. Also, driving would be more courteous and defensive with minimum pressures, etc...Likewise, camping could be more enjoyable in site choice, selection of materials for shelter, comfort and security from thieves, flood, fire, animal life, cold, darkness... or too much sun and heat. These are but a small sampling of the "influences" use. Much can be done, especially when all eight of D, 1-8 items are applied.

LIVING

vicinity of "Sportsmans' Paradise" inevitably results in armed incursions by hunters, pros, and neophytes, fishermen and picnicers. This invited peace of mind disasters as well as dead cows, horses, and pets, etc., and frequent property repairs even enforced hospital vacations...In essence, historical situations which have influenced the development of architecture as a functional art/science can indeed and do affect man in his daily life historically and today. Some examples:

1. Security from weather extremes
2. Security from human foragers
3. Security from unwanted animal life
4. Security from high property taxes
5. Security from poor house construction
6. Security from improper building inspection
7. Security from antiquated zoning codes
8. Security from unwanted water incursions
9. Security from unwanted power black-outs, etc.

RELATED

	LEVELS:							GOALS ---
AREA CONTENT	COURSE				GRADE			WORK
	I	II	III	IV	K/6	5/9	9/12	
II. CAREERS IN ARCHITECTURE		X	X				X	The ability to transfer abstract ideas into a visible language and then to a finished product involving many diversified talents as per A. "Composition of Architect", 1-9.
A. COMPOSITION OF ARCHITECT		X	X				X	
1. Mathematics 2. Physics 3. Geology/Chemistry 4. History 5. Social Science 6. Literature/Report Writing 7. Law 8. Fine Arts 9. Design Drafting- depth of work equal to college majors in 1, 2, 8, and 9 and minor strength in others.								
B. TRAINING REQUIRED (PRESENTLY, 1980)		X	X				X	Insight information in this area of general goals
1. Method I a) 5-6 years of college b) 3-4 years of apprenticeship c) AIA Licensing Exam								
2. Method II a) 2 years of technical school b) 8 years of apprenticeship c) AIA Licensing Exam								
3. Method III a) High School Drafting and Design b) 10-12 years of apprenticeship c) AIA Licensing Exam								
C. CAREER RAMIFICATIONS		X	X				X	Insight information to create intrinsic motivation for the long haul for those interested vaguely or in-depth in this discipline of allied architecture for their Worlds of Work.
1. General Practicing Architect 2. Specialist (Working for firm) (a) Structuralist								

GENERAL for the WORLDS of :

RECREATION	LIVING	RELATED
Where and whenever these areas of; A, "Composition of Architect", B, "Training Required", and C, "Career Ramifications", are applicable to the World of Recreation for those involved in this activity.	For better consumers of the products of general architecture in their enlightened awareness, understanding, evaluation, and possible purchase of such products.	Career oreintation here is an outgrowth of the A through C items listed in the major headings at the extreme left of this double page.

AREA CONTENT	LEVELS: COURSE I	II	III	IV	GRADE K/6	5/9	9/12	GOALS --- WORK
II. CAREERS IN ARCHITECTURE, cont'd								
C. CAREER RAMIFICATIONS, cont'd b) Drafter c) Designer d) Specification and conditions writers e) Display artists/modelists 3. City Planning 4. Industrial Design 5. Furniture Design 6. Interior Design 7. Landscape Architecture 8. Author/Teacher of Architecture		X	X				X	
D. TYPES OF BUILDINGS 1. General Residential: a) Private houses b) Apartments c) Condominiums d) Town houses f) Hotels g) Motels h) Castles i) Estate houses j) Ranches 2. Municipal: a) Hospitals b) Libraries c) Museums d) Memorials/tombs e) Towers f) Government g) Fire/police		X	X	X			X	To have a knowledgeable understanding of the wide variety of buildings possible. To have an appreciation and understanding of: 1. Research and evaluation of support data for any building project. 2. The public relations/sales pitch accompanying such endeavors. 3. The legal and political ramifications involved in such action. 4. The financial implications for those concerned with such a project- including the average citizen. 5. The planning involved in generating ideas into material directions such as drawings, specifications, models, and general contract conditions...

GENERAL for the WORLDS of :

RECREATION	LIVING	RELATED
To gain sufficient knowledge concerning any of the building types so that this will prove useful in a recreation sense.	To develop fundamental attitudes beneficial to the consumer in his co-existance with those who would change his neighborhood, i.e., to learn to lobby for or against a project, to learn what his legal rights are in possible land acquisitions unfavorable to his life style, etc.	Orientation to new careers here would involve any and everything related to the first idea leading to visible directions to structural implementation to applied use to the maintenance and repair of such projects from A to Z. In addition, interest could be generated in a wide variety of related offshoot areas such as: 1. Total Alternate Energy a) Solar b) Wind c) Ocean d) Streams (Hydraulic) e) "Garbage" f) Nuclear Fusion, etc. 2. Forestry- total 3. Climate Control Ramifications a) Ecological b) Design c) Electronics d) Plumbing/Heating e) Carpentry, etc. 4. Surveying and related 5. Bridges- total 6. Roadways, etc.

AREA CONTENT	LEVELS: COURSE I	II	III	IV	GRADE K/6	5/9	9/12	GOALS --- WORK
II. CAREERS IN ARCHITECTURE, cont'd		X	X	X			X	
D. TYPES OF BUILDINGS, cont'd		X	X	X			X	6. The methods of construction. 7. The materials of construction.
h) Prisons i) Schools j) Sports Arenas k) Transportation Terminal l) Sewage Plants m) Parking Terminals								8. The applied purposes and functions of such structures. 9. The smooth healing of landscaping scars generated by any construction.
3. Religious: a) Churches b) Cathedrals c) Synagogues d) Temples e) Mosques f) Pagodas g) Shrines h) Cemetaries i) Monasteries								10. The possible pedestrian and vehicular traffic problems created or resolved by such structures. 11. The gain or loss of revenue for the immediate community. 12. Finally, the smooth integration of the project into the local community demonstrated by the positive acceptance of the project.
4. Industrial: a) Factories b) Laboratories c) Industrial Parks d) Public Utilities e) Waste Reclamation								
5. Business: a) Stores b) Restaurants c) Garage/Parking service d) Skyscrapers e) Towers								
6. Entertainment: a) Auditoriums b) Sports Arenas c) Theaters d) Recreation Facilities								

GENERAL for the WORLDS of :

RECREATION	LIVING	RELATED

AREA CONTENT	LEVELS:							GOALS ---
	COURSE				GRADE			WORK
	I	II	III	IV	K/6	5/9	9/12	
III. CONSUMER PROTECTION/LEGAL AND FINANCIAL IMPLICATIONS								
A. PROTECTION OF CLIENT AND COMMUNITY			X	X			X	To understand the need for, and successfully utilize zoning as a means of assuring the client that he will receive a properly constructed building; suited to his needs and which also meets zoning and building standards established for that area.
B. SAFETY AND DURABILITY OF BUILDING			X	X			X	
C. DESIGN AND APPEARANCE re: View, Site, and Landscape			X	X			X	
D. PROTECTION FROM FINANCIAL LOSS			X	X			X	The building inspector, often maligned, protects the owner, contractor, local government, bank, suppliers, and insurers. Materials, building practices, and workmanship are checked. Materials are checked prior to delivery, during construction, and upon completion of the building.
E. CONTRACTOR SELECTION ASSISTANCE			X	X			X	
F. TITLE SEARCH (In-depth)			X	X			X	
1. Hidden Past 2. Deed of Restrictions- Present, Future 3. Rights of Way 4. Vulnerability of Property a) Journeyman liens b) Mechanic liens c) Quit Claim Deeds								Titles, deeds, Deeds of Restriction, easements, Rights of Way, and liens are checked by lawyers to protect builders, buyers, loan agencies, and insurers.
G. CONSTRUCTION CONTRACTS			X	X			X	To be knowledgeable in the following areas related to contracts: Advertisement for bids, index, instruction to bidders (By sections), special conditions (By sections), general conditions (By sections), proposals, bid form for general construction contract, Bid Bond, technical specifications (By sections), working drawing data, copy of agreement, copy of Performance Bond, copy of Labor and Material Bond, copy of estimate of payment due, and any details required beyond these items relative to specifics.
1. Rigid 2. Flexible 3. Open End 4. Specifications								

GENERAL for the WORLDS of :

RECREATION	LIVING	RELATED
To be able to successfully plan for backyard playground, municipal playgrounds, camp facilities, stadiums, etc. The backyard play area may include swings, sandboxes, horseshoe pits, volley ball, tether ball, swimming pool, etc. Municipal playgrounds include the above facilities, provide special facilities for scout camps, 4-H Groups, handicapped, etc., and provide room for growth. Some of the special facilities are; boating, hiking, swimming, fishing, games, crafts, cooking, housing, and seasonal and post-seasonal storage. In all cases, lot sizes, contours, zone restrictions, location of trees, rainfall, and water level during wet and dry seasons, are important.	The enlightened consumers in planning homes should observe basic steps following an examination of the size, needs, and desires of a family. Family income, choice of location, and design are considered. Future needs are anticipated. A family's needs change with the years, but the house stays the same. In later years, a home that adequately cared for a family of five or six, may be too much for an elderly couple to afford and to maintain.	Related careers would include: 1. Lawyer 2. Surveyor 3. Geologist 4. Landscaper 5. Building Inspector 6. Loan and Property Appraiser
To be able to utilize the World of Living goals for recreational purposes, i.e., that vacation hideaway, skiing lodge, or whatever, that one has always wanted. The same can be applied to varying degrees to other recreational purchases, etc.	There are many professionals who can help in a real estate transaction; the realtor who lists and sells the property, the lawyer who searches titles and prepares the purchase contract, the surveyor who locates the property lines, and the lending institution which supplies the finances. The enlightened buyer, understanding the intricacies of building, construction, researching, and all its legalities, would do well to consult these people prior to making any decision to purchase.	

AREA CONTENT	LEVELS: COURSE I	II	III	IV	GRADE K/6	5/9	9/12	GOALS --- WORK
III. CONSUMER PROTECTION, cont'd								
H. SOIL CHARACTERISTICS			X	X			X	*To properly prepare any building site, there must be landscaping knowledge and skills to allow the engaging of obstacles such as unwanted water (ponds, streams, or soil water level), trees, underbrush, rocks, ravines, etc.- either to move or remove them.* *Required also are the knowledge and skills to properly remove, store, and later reapply topsoil for proper landscaping.* *In addition, knowledge and skills to properly utilize surveying and layout equipment and techniques, i.e., building stakeout, batter boards, lines, squares, 3-4-5 Method, transits, level, etc., are required.* *Finally, knowledge and skills relative to varying soil and bearing characteristics are essential, i.e. differing footings, concrete mixes, reinforcement, pouring, curing, water proofing, functional drainage, and backfilling.*
1. Boring Samples *2. Drainage Saturation* *3. Termites* *4. Top Soil* *5. Safe Load* *6. Soil Removal*								
I. ZONING AND RESTRICTIONS		X	X	X			X	*Knowledge, skills and understanding of application of zoning and its specifics are vital, i.e., city zones govern: single family, multiple family, condominums, town houses, apartment buildings, shopping areas, commercial areas, light and heavy industrial areas, etc. Zoning may also cover minimum size of lot, maximum size of building per lot size, minimum building height, and minimum floor space.. Within declared historical areas, even house styles may be dictated.*
1. Local *a) Fire* *b) Building Codes* *c) Zoning requirements* *d) Utilities* *e) Protection of established neighborhoods*								
J. STATE (May overlap Local)			X	X			X	*Factors of safety, rights, sanitation, and waste disposal are also to be considered.*
1. Fire Marshal		X						
2. Environmental Control		X						

GENERAL for the WORLDS of :

RECREATION

Again, it is essential that there be the understanding that the safety of the participant and the patron are the results of regulations which cover playgrounds, lakes, rivers, stadiums, and other recreational gathering places. These guidelines will cover entrances, exits, sanitary facilities, safety of construction, fire prevention, and medical facilities (in some areas).

LIVING

Where town sewage or town water is not provided, it becomes necessary for the new homeowner to be informed of costs for septic fields and water wells.

In these days of chemical pollution, the well-informed consumer would do well to thoroughly investigate the area. Frequently a few years after purchase of a house, the community declares the septic tank outmoded. It then becomes necessary for extra expenditures to become part of a local sewage system.

In the field, a plate test will determine soil stability and soil settlement. A density test will measure the soil's compaction. Laboratory tests will determine soil strength, plasticity, compressability, and liquid limit.

RELATED

Related careers would include:

1. Foundation Contractors
2. Masons
3. Graders
4. Excavators
5. Geologists
6. Soil and Water Analysts

These people play an important role in feeding back information to the consumer/buyer.

Exposure to careers such as:

1. Lighting Engineers
2. Climate Control Technicians
3. Sound Engineers, etc.

Most skills may be used to some degree with some modification in most of the areas of architecture.

AREA CONTENT	LEVELS:							GOALS --- WORK
	COURSE				GRADE			
	I	II	III	IV	K/6	5/9	9/12	
V. CONSUMER PROTECTION, cont'd								
J. STATE, cont'd								Where federal funds and/or properties are involved, restrictions of federal agencies may over-ride state and local laws.
3. Water Rights		X						
4. Sanitation		X						
5. Waste Disposal (Residential and industrial)		X						
6. Regulations Regarding								
a) Schools								
b) Hospitals								
c) Public Buildings, etc.								
K. FEDERAL			X	X			X	
1. FHA								
2. HEW								
3. HUD								
4. VA								
5. FNMA, etc.								
L. INTERNATIONAL REGULATIONS			X	X			X	
1. Mining								
2. Waterways								
3. Air Passages								
4. Farming				X			X	
5. Open Land								
6. Transportation								
7. Border Encroachments								
M. PRESSURE GROUPS				X			X	
1. Minorities								
2. OSHA								
3. Medicare								
4. Regional Planning and Historical Groups								

GENERAL for the WORLDS of :

RECREATION	LIVING	RELATED
In large areas, some enclosed, air pollution becomes a problem and therefore, air cleansing facilities become necessary. Proper lighting and heating come into play here.		

AREA CONTENT	LEVELS:							GOALS --- WORK
	COURSE				GRADE			
	I	II	III	IV	K/6	5/9	9/12	
III. CONSUMER PROTECTION, cont'd								
N. CONSTRUCTION				X			X	
1. Building								
a) Purpose								
b) Site								
c) Cost								
d) Design		X	X	X				
e) Location		X	X	X				
2. Contracts				X			X	
a) Specifications								
b) Drawings								
c) General Contractors								
d) Sub-contractors								
3. Site Clearance								
a) Salvage								
b) Earth removal								
c) Earth disposal								
d) Obstacle removal (rocks, trees, etc.)								
O. INSPECTION				X			X	To knowledgeably understand the techniques, checklists, and data comparisons of visual and applied testing processes included in the inspection of any construction. This results in a normal "Punch List", a list of major and minor defects which is submitted to the general contractor whose responsibility it is to correct them to the satisfaction of the architect, engineer, and the owner. Any building inspection normally results in a "Certificate of Occupancy" stating only that the building may be occupied safely and not that all is perfect.
1. Punch List- Contractor/Buyer								
2. Structure Inspection								
3. Utilities								
4. Certificate of Occupancy								
5. Warranties								
a) Supplier								
b) Manufacturer								
c) Contractor								
d) Sub-contractors								

GENERAL for the WORLDS of :

RECREATION	LIVING	RELATED
Essentially, a combination of both the Worlds of Work and Living.	*To be able to utilize the World of Work goals as enlightened consumer application to own problem areas dealing with one's own dwellings; home, store, business, etc.*	

	LEVELS:							GOALS — — —
AREA CONTENT	COURSE				GRADE			WORK
	I	II	III	IV	K/6	5/9	9/12	
III. CONSUMER PROTECTION, cont'd								*Warranties* may be included which promise that certain items will be free of defect for a certain period of time. Some of these warranties are provided by the contractor, some by the supplier, and some by the manufacturer.
P. CLOSING 1. Purpose a) To turn property over to new owner b) Assumption of mortgage and responsibility for property 2. Costs a) Legal fees b) Taxes and tax stamps c) All banking closing fees				X			X	To completely understand the total implications and full responsibilities of final acceptance of any closing, for upon confirmed correction of all defects, the owner, contractor, and respective lawyers meet, and the contractor releases his ownership of the property turning it over to the owner. Along with ownership come releases of claims, liens, and warranties and manuals. The owner then accepts the project, pays the contractor all that is due and then the contract is considered "closed". From here on, the owner assumes all responsibilities for the property and any expenses involved in his part of the closing. Among these expenses might be; taxes, legal fees, registration fees and stamps, and any required mortgage and real estate taxes. Closing costs may vary from a few hundred dollars to several thousand dollars.

GENERAL for the WORLDS of :

RECREATION	LIVING	RELATED
Essentially the same goals apply here as for the World of Living.	*The well-informed consumer must be just that! In addition to obtaining a good title free from liens and easements. He must be aware of Rights-of-Way on his property, if any, and he must sometimes provide himself with title insurance to protect himself financially against any unforeseen contingencies. He will also become familiar with all aspects of any warranties that he may have received at the closing.*	*No new career exposures*

	LEVELS:							GOALS ---
	COURSE				GRADE			
AREA CONTENT	I	II	III	IV	K/6	5/9	9/12	WORK
IV. ARCHITECTURAL PLANNING FUNCTION								
A. INTERIOR HOUSE PLANNING (Best solar and wind use)			X	X			X	A thorough knowledge of the concepts of good internal design is essential in this unit. These concepts are based on studies by the original land-grant agricultural colleges and subsequently by the A.I.A. and the Kitchen, Appliance and Cabinet Concerns of the nation[1] This, between the 30's through the 50's... Essentially, this means positive use of solar energy in a functional manner as well a strategically placing the areas for best nois and function control and usage. Since sleeping is done at night, usually, sun exposure, here, should be minimal. Thus, bed rooms ideally should face northerly for this geographic area[2]. This automatically provide the cooler evening temperatures necessary for healthy rest/sleep. Conifer trees and shrubs will control the extreme cold by deflecting the northerly winds above the house...this would also normally mean one end of the house removed from the noise and activities of the others. The kitchen-centered or working area should face easterly to receive early morning sun only. After 9:00 A.M. it's normally unbearal for the summer...afternoon sun is totally unacceptable for this reason, particularly when air conditioning is not desirable as a natura solution to solar control. Also, apparently, early morning sun in this area appears to provide a psychological lift for the day.
1. Rest Area = bedrooms/sleeping			X	X			X	
2. Work Area = foods, clothing, family (old fashioned kitchen concept)			X	X			X	
3. Living Area = living and dining areas (formal) and front entry			X	X			X	
4. Transitional Area = halls, entrys, stairs, bathroom, multi-functional rooms			X	X			X	
5. Built-Ins = all areas and rooms inclusive...special accent on areas such as halls, entrys, and stairs for maximal space use re multi-function.			X	X			X	
Note: A hallway as a hallway only is too often wasteful and inefficient design, but, if other functions can be contained here as well, a particularly long hallway can normally be defended and justified.								

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[1] House & Home, Architectural Forum, Architectural Record, etc. pushed this in the 1950'

[2] Applicable to all areas for this general geo graphic area- most of North America.

GENERAL for the WORLDS of :

RECREATION

A knowledge concerning living space planning is very helpful for those especially charged with the responsibility for the comfort and success of leisure-time activities affecting others... for example the planning and building of a summer vacation home in the "raw"...knowing about proper orientation, functional approach to room and area layout as well as use of proper materials, etc., will lead to a well designed,comfortable shelter, be it in the woods, desert, mountainside or the shore of a lake, etc.

Thus, maximal use will be made of solar energy, existing winds, trees, and shrubs, people-needs, and desires, as well as terrain, etc.

Even in simple scout bivouacking, a knowledge about the proper use of deciduous and coniferous foliage, existing breezes, sun exposure and snow control can lead to a comfortable existance when necessary.

LIVING

The ability to apply this training and knowledge to daily-life existence can make living a joy, particularly when your proposed builder/designer has had no experience in the scientific approach to functional house planning. Your expertise plus his implementation will provide an excellent house.

Even an old, existing structure can be updated re better area layout, storage, traffic flow, climate control-using correct foliage, creating functional cornice overhang, etc.

RELATED

Career identification can definately be enhanced in this area for:

1. General Architecture
2. Architectural Designing
3. Architectural Research
4. Interior Decorating
5. Industrial Design
6. Appliance Design
7. Cabinetry
8. General Plastics
9. Forestry
10. Solar Energy
11. Bathroom-Fixture Design
12. Ventillation
13. Climate Control
14. Ecology Engineering
15. Surveying, etc.

AREA CONTENT	LEVELS: COURSE				LEVELS: GRADE			GOALS --- WORK
	I	II	III	IV	K/6	5/9	9/12	
IV. ARCHITECTURAL PLANNING FUNCTION, cont'd.								The living area should have sun throughout the day, if possible. This is the place where most of the waking hours are spent. Therefore, solar energy should bathe this area. Deciduous trees, shrubs, and large cornice overhangs will control the summer sun. In the winter, the absence of leaves will allow the lower sun rays to play on the large South to Southwest exposure windows and be passively collected as well as to provide direct radiant heat to the interior.
B. LAND USE RELATIVE TO HOUSE NEEDS			X	X			X	
1. Zoning Requirements for residential, business, industrial, etc.			X	X			X	A working knowledge of zoning requirements is essential for proper and legal house placement on-site. Correct interpretation and understanding are vital in this endeavor. Zoning requirements often differ between communities so clarification must be sought re:
2. Sewage Requirements- private systems preferred (public units are no problem in drawing)			X	X			X	
3. House Site Position Considerations: a) Orientation b) Topography c) Conifers d) Deciduous e) View f) Accessibility g) Child play area h) Outdoor living area i) Flower and garden areas j) Outdoor recreational area/general k) Refuse storage area			X	X			X	1. Legal size of plot; survey required 2. Utilities, i.e. electricity, telephone, sewerage, water supply, and gas supply all relative to the house placement, property lines, and other pipe systems 3. The type (style) of house permitted in the area; one or multiple family, height restrictions, external appearance, etc. 4. House placement on plot; front yard, side yards, rear yard- depths re existing property lines 5. Legal access to site 6. Generally, such things are considered as: legalities, health, safety, service, esthetics, etc.
4. Structural Details- Residential			X	X			X	
a) Exterior walls, masonry, solid or veneer								

GENERAL for the WORLDS of :

RECREATION

A knowledge of zoning should be beneficial for any hobby enthusiast, be it fresh air or indoor...for example, too much unadulterated volume- be it Beethovan, Miller, or Rock, or exclusive business zoning, will engender legal problems- indoors, or out.

Likewise, if out "naturing" it with Thoreau, and the urge strikes, the recipeint had better not be a stream leading to the local swimming area. Health officials take a dim view of this. In the same vein, any outhouse for a camp must not leach into any potable water supply, or be closer than 150 feet to any well water collector. Even so, the odors from leaching trenches, when rain has been plentiful, will have health officials there pronto!

Certainly, a knowledge of proper site usage re architectural guidelines will greatly enhance whatever camping shelter may be constructed.

LIVING

Needless to say, any kind of zoning knowledge will, if properly implemented, greatly enhance the joy of daily living in one's own house amidst one's neighbors...i.e., in peace.

Any violation, such as those incurred by recreationists, will bring even faster and generally more positive responses.

Generally, no property-line encroachment; human, animal, or faunal form, is permitted for long.

Also, a knowledge of water wells, septic systems, fuel lines, etc., will make for fewer financial problems for oneself without ever encroaching on anyone...

Similarly, any knowledge concerning orientation, foliage control, topography, recreation area planning, view enhancement, wind utilization, etc. will very much improve normal daily life.

RELATED

Further career identification would merely reinforce the already existing "House Planning" Areas.

AREA CONTENT	LEVELS:							GOALS --- WORK
	COURSE				GRADE			
	I	II	III	IV	K/6	5/9	9/12	
IV. ARCHITECTURAL PLANNING FUNCTION, cont'd								
								Obviously, placement of gas, fuel, water, sewage, and often electrical pipelines is important- Know Local Codes! The state health codes should be consulted for proper design, construction, and placement of: 1. Potable water supply source 2. Functional sewage system, i.e., septic tank and leaching system, fields or wells, also dry wells. A thorough knowledge should be gained about; best solar and wind use for the house, retention advantages of original topography, correct use of coniferous and deciduous trees and shrubs for solar and wind control, view enhancement where possible, accessibility from road, recreational areas for children and adults, outdoor living, proper placement of floral and vegetable garden areas, and proper refuse and mulching area design and implementation. The abilities to do factual research and take sensible notes are important.
4. Structural Details, cont'd 1) Brick 2) Stone 3) Block 4) Tile 5) Stucco			X	X			X	

GENERAL for the WORLDS of :

RECREATION	LIVING	RELATED

AREA CONTENT	LEVELS: COURSE I	II	III	IV	GRADE K/6	5/9	9/12	GOALS — — — WORK
IV. ARCHITECTURAL PLANNING FUNCTION, cont'd. b) Exterior walls, framing, wood, or metal 1) Platform 2) Braced 3) Balloon 4) Post and beam c) Interior walls, bearing and non-bearing. d) Fire walls e) General building materials 1) Wood 2) Steel/cast iron 3) Aluminum 4) Copper/brass 5) Plastic 6) Concrete/stone/brick f) Applied building construction 1) Field (on-site) 2) Pre-fab 3) Combination								A working knowledge of structural building techniques and practices is essential in properly planning all phases of any building/structure. This, prior to researching, data-gathering, interpretation, and implementation into preliminary, working, detail, and pictorial drawings, plus specification writing and general conditions, etc. The physics/mathematics/chemistry of longevity, weather wear, and live/dead weight thrust, pressure, bearing, shear, strain, compression, pre-stressing, must be understood in relation to design, planning, and implementation of all building materials so that nothing will be demanded of any material or process that cannot be fulfilled (No Hartford Colosseum Roofs!). This means working knowledgeably with tables, charts, nomographs, vectoring, as well as applied mathematics. A constant updating via trade manuals, A.N.S.I. Standards, A.I.A. Research and Texts, journals, research papers, project results, government testing and consumer information materials, etc., must be sought out, digested by the teachers, and be made available to all students who seek to benefit therefrom. This kind of information is required World of Work Objectives/Goals for all of the Part IV, B, 4-15.
5. Residential Structural Components a) Pilings 1) Concrete 2) Wood 3) Reinforcedconcrete			X	X			X	

GENERAL for the WORLDS of :

RECREATION	LIVING	RELATED
A good knowledge of residential structural details should be beneficial for any recreational activity, be it building shelters, laying out trails, constructing bridges, setting up camp parking facilities, laying out refuse dumps and backhouses, proper solar use (passive collectors, berming, etc.) All materials and processes can be used correctly or poorly- if graphed, positively, or negatively. Obviously, this kind of use should be positive, not negative...i.e.: 1. Not using 2 x 4's for joists or rafters when clear spans are too long. 2. Not creating butterfly roofing when adequate flashing and drainage do not exist. 3. No cantelevering of porch when only undressed native White Pine would be replacing Southern Long Leaf Yellow Pine or Douglas Fir of same size. 4. No exposing of untreated Maple in moist termite areas, or untreated aluminum in salt water atmosphere, or of uncoated nails flush with surface clear pine soffits, etc.	Obviously, this kind of knowledge of the working world goals/use can only prove beneficial to applied consumer utilization. This kind of knowledge will enhance his homeowning use years resulting in better selection of materials, better and longer use of products, proper maintenance, fewer repairs, less overall expense, greater joy in use of items, etc.	Career identification here would definately reinforce the already existing "House Planning" Areas plus Section II, Careers.

	LEVELS:							GOALS ---
AREA CONTENT	COURSE				GRADE			WORK
	I	II	III	IV	K/6	5/9	9/12	
IV. ARCHITECTURAL PLANNING FUNCTION, cont'd								
5. Residential Structural Components, cont'd			X	X			X	
b) Footings								
c) Foundations								
d) Slabs								
e) Sills								
f) Anchor Bolts								
g) Termite Shielding								
h) Headers								
i) Fire Stops								
j) Bridging								
1) Wood- crops 2) Wood- solid 3) Metal straps 4) Metal wiring								
k) Sub Flooring								
1) Diagonal tongue and groove 2) Plyscord 3) Composition Board								
l) Shoe Plates								
m) Studding								
1) Wood 2) Steel 3) Aluminum								

GENERAL for the WORLDS of : 151

RECREATION	LIVING	RELATED
364		365

AREA CONTENT	LEVELS: COURSE				LEVELS: GRADE			GOALS --- WORK
	I	II	III	IV	K/6	5/9	9/12	
IV. ARCHITECTURAL PLANNING FUNCTION, cont'd								
5. Residential Structuring Components, cont'd			X	X			X	
n) Trimmers								
o) Lintels/Double Headers								
p) Top Plates								
q) Ceiling joists								
r) Rafters/trusses/purlins								
s) Tie-Ins/Collar Beams								
t) Ridge Rafter/Cusset Plates								
u) Roof Decking (Sheathing)								
v) Roofing								
1) Building paper 2) Saturated felt 3) Rolled mineral surfaced i. single ii. double selvage 4) Asphalt mineral surfaced shingles i. Wood appearance strip ii. Conventional strip/slots iii. Continuous strip/no slots iv. Individual lock down 5) Wood shingles/cedar i. regular ii. shakes 6) Mineral fiber (Asbestos, cement) 7) Tile 8) Galvanized (Zinc centered) sheets								

GENERAL for the WORLDS of :		153
RECREATION	LIVING	RELATED
368		369

AREA CONTENT	LEVELS: COURSE				GRADE			GOALS --- WORK
	I	II	III	IV	K/6	5/9	9/12	
IV. ARCHITECTURAL PLANNING FUNCTION, cont'd								
5. Residential Structuring Components, cont'd			X	X			X	
9) Aluminum								
i. corrugated								
ii. sheets								
10) Terne Metal (Copper, Steel, Lead)								
w) Wall Siding/shingles/boards								
1) Wood, plyscord, TG boards								
2) Composition board, panels								
3) Metal, Aluminum, Steel, Porcel								
4) Plastic								
5) Asphalt								
6) Fiberboard (Asbestos/cement)								
x) Fenestration								
1) Double hung								
2) Sliding								
3) Casement								
4) Hopper								
5) Awning								
6) Storm sash								
7) Thermal units								
y) Doors- external/internal/fire								
1) Flush								
2) Panel								
3) Wood								
4) Metal								
5) Plastic								
z) Dry wall/plaster								
aa) Finish carpentry								
bb) Hardware- rough and finish								

GENERAL for the WORLDS of :		155
RECREATION	LIVING	RELATED

AREA CONTENT	LEVELS: COURSE I	II	III	IV	GRADE K/6	5/9	9/12	GOALS --- WORK
IV. ARCHITECTURAL PLANNING FUNCTION, cont'd								
6. Utilities/Mechano-Electrical			X	X			X	
a) Electrical								
1) Service								
2) House circuits								
3) Heating units								
4) Forced exhaust units								
5) Air conditioning								
b) Hydraulic (Public service to foundation shut off)								
c) Plumbing/Metals								
1) Water supply system- internal								
2) Waste removal system-vents, fixtures to foundation wall								
3) Exterior sewage system- septic/leaching								
4) Venting								
5) Flashing								
6) Gutters, leaders, drywell								
7) Heating- ducting/boilers								
d) Heating, Cooling (Climate Control)								
1) Systems- radiant/convection								
i. Forced hot air								
ii. Hot water								
iii. Steam								
iv. Radiant								
e) Energy Source								
1) Gas								
2) Oil								
3) Coal								
4) Wood								

GENERAL for the WORLDS of :		157
RECREATION	LIVING	RELATED

	LEVELS:							GOALS ---
	COURSE				GRADE			
AREA CONTENT	I	II	III	IV	K/6	5/9	9/12	WORK
IV. ARCHITECTURAL PLANNING FUNCTION, cont'd								
7. Communication			X	X			X	
a) Telephone								
b) Door bells								
c) Intercoms								
d) TV/radio								
e) Alarms								
f) Regulators								
g) Computers								
h) Teletype								
8. Insulation			X	X			X	
a) Types:								
1) Reflective								
2) Blanket								
3) Batts								
4) Loose fill								
5) Rigid/Panel								
6) Foam								
b) Use:								
1) Heat control								
2) Noise control								
3) Moisture control								
9. Interior Wall Surfaces			X	X			X	
a) Fixed								
b) Movable								
c) Divider								
d) Materials:								
1) Plaster- wet wall								
2) Dry wall								
i. Gypsum								

GENERAL for the WORLDS of :

RECREATION	LIVING	RELATED

AREA CONTENT	LEVELS: COURSE				GRADE			GOALS --- WORK
	I	II	III	IV	K/6	5/9	9/12	
IV. ARCHITECTURAL PLANNING FUNCTION, cont'd								
9. Interior Wall Surfaces, cont'd			X	X			X	
ii. Wood iii. Glass iv. Plastic V. Fabric vi. Tile, etc.								
10. Interior Ceiling Surfaces			X	X			X	
a) Direct								
b) Hung								
c) Cathedral								
d) Materials as above i-iv								
11. Flooring Surfaces			X	X			X	
a) Concrete b) Terrazo/ceramic tiling c) Salte d) Metal e) Wood f) Plastic- tile/rolled g) Rubber- tile/ rolled h) Linoleum- tile/rolled i) Carpeting, etc.								
12. Trim			X	X			X	
a) Windows								
b) Doors								
c) Baseboard								
d) Ceiling								

GENERAL for the WORLDS of : 161

RECREATION	LIVING	RELATED

	LEVELS:							GOALS ---
AREA CONTENT	COURSE				GRADE			WORK
	I	II	III	IV	K/6	5/9	9/12	
IV. ARCHITECTURAL PLANNING FUNCTION, cont'd								
12. Trim, cont'd			X	X			X	
e) Stairs								
f) Wainscotting								
g) Fireplace								
h) Bookcases								
i) Closets, etc.								
13. Finishing			X	X			X	
a) Plaster- smooth/swirl								
b) Wall paper/cloth								
c) Paints								
d) Stains								
e) Shellac								
f) Varnishes								
g) Wax								
h) Oils, etc.								
14. Accessories			X	X			X	
a) Cabinets								
b) Counters								
c) Storage facilities								

GENERAL for the WORLDS of :		163
RECREATION	LIVING	RELATED
388		389

AREA CONTENT	LEVELS: COURSE				GRADE			GOALS --- WORK
	I	II	III	IV	K/6	5/9	9/12	
IV. ARCHITECTURAL PLANNING FUNCTION, cont'd								
14. Accessories, cont'd			X	X			X	
d) Fixtures 1) Plumbing 2) Lighting, etc.								
15. Landscaping			X	X			X	
a) Grading								
b) Exterior lighting								
c) Gardens								
d) Pools								
e) Driveway/walks								
f) Fencing								
g) Play and work areas								
h) Patio								
i) Trees and shrubs								
j) Lawns, etc.								

GENERAL for the WORLDS of :

RECREATION	LIVING	RELATED

	LEVELS:							GOALS ---
	COURSE				GRADE			
AREA CONTENT	I	II	III	IV	K/6	5/9	9/12	WORK
V. ARCHITECTURAL DRAWING FUNCTION								
A. DRAWING PHASE			X	X			X	A thorough understanding of, and the ability to draft all directions to workers of the building professions is essential. Other than the basics of fundamental drafting, these are the ability to make:
1. Sketches			X	X			X	1. Sketchings, ideas, roughing-out, problem solving, free-hand art
2. Preliminary Drawings			X	X			X	2. Preliminary- usually 1/8 inch-scale drawing notations and sketches in semi-finished form. Total assembly of all rooms, halls, storage, etc., in terms of shape, styling, zoning, orientation, services, and costs...spatial relations.
3. Math Computations:			X	X			X	3. Math, calculations for weight bearing, timber and footing sizes, distance spanning, live and dead loading, soil-support capabilities, wind and snow loading.
a) Arthimetical b) Tables c) Vectoring d) Nomographical								
4. Working Drawings			X	X			X	4. Working drawings = 1/4 inch scale, if possible. Aim for finesse and detail required by A.I.A. for professional work. All drawings, plans, elevations, and details must be fully dimensioned, schedules and symbology given. A contoured topographical-survey plot plan should be included. Math calculations, Number three, above, should be linearized into all details deemed essential for clarification of drawings. The complete plumbing, electrical, and climate control details should also be included.
a) Contoured topo-survey plot plan b) Floor plans c) Elevations d) Details- construction and design loading e) Details- electro-mechanical, plumbing systems								
5. Display Drawings			X	X			X	
6. Contract Documents			X	X			X	
a) Agreements b) General conditions c) Specifications								

GENERAL for the WORLDS of :

RECREATION	LIVING	RELATED
The ability to put ideas on paper in acceptable drafting form is most beneficial for any recreation enthusiast-particularly architecturally. Many situations can be solved before they become problems. This knowledge and the ability to implement same is a major boon for the camp director who must renovate, for the potential recreation area manager who must build on a new site, for the scout master who must prepare for anything, etc.	Obviously, having proven architectural drafting abilities will make the homeowner much more independent of most pressures that can be engendered by daily life, for example; the repair of the roof, replacement of existing girders under seldom used bedroom now that mother will be moving in, strengthening bearing partition for new attic area, etc. New construction, of course, leaves one far ahead any way one views it; legally, financially, esthetically, comfortwise, etc.	Here too, further career identification would merely reinforce the already existing "House Planning" areas.

AREA CONTENT	LEVELS: COURSE				GRADE			GOALS --- WORK
	I	II	III	IV	K/6	5/9	9/12	
V. ARCHITECTURAL DRAWING FUNCTION, cont'd								5. Display drawing techniques are vital. One and two-point perspective (later three-point) must be learned. Renditioning should also be mastered in pencil, charcoal, colored pencils, inks, and brush and air-brush, if at all possible. 6. The typed materials dealing with the written contracts, i.e., agreement, general conditions, and specifications, should be learned, preferably using the A.I.A. Short Revised Forms. ...Here, the ability to research, take cogent notes, and type are essential.
B. MODEL MAKING PHASE			X	X			X	
1. Total House, 1/4 inch scale a) Exterior complete b) Fully landscaped c) With or without detachable roof to show complete furnishings			X	X			X	Since architectural models are vital to the profession, students should become adept at planning and building them. Things to be stressed are: 1. Critical thinking 2. Spatial relations 3. Originality 4. Neatness 5. Precision 6. Proper planning 7. Proper use of: a) rulers b) scribers c) squares d) skill knives e) band saw
2. Working Area Model in 3/4 inch scale, Fully Furnished a) Foods area (old kitchen) b) Family area (old breakfast nook-original family kitchen) c) Clothing area (old laundry plus sewing center) d) Rear entrance (mud room, cellar stairs, rear closet) e) Powder room in rear entrance area (desirable)			X	X			X	

GENERAL for the WORLDS of :

RECREATION

The knowledge and ability to create architectural models can be most helpful, particularly where the sheer joy of creation for gifts in concerned, for example; making a scaled doll house for someone, or a version of the new house to be for one's offspring, or a replica of an abode associated with fond memories, etc.

Especially where perception is lacking, this kind of crystallization can do wonders in selling a project, for example; the new scout camp cabin for the girls' troop, or the new kitchen area wing for sister's present house, or the garage extension, etc.

LIVING

The same objectives of recreation re model building architecturally apply here, but more so. This is a day by day living situation- not once every three months, or when the hobby/spirit strikes. This is demand performance produce or pay to have it done if model it must be.

RELATED

Again, the already identified "House Planning" careers remain, but with the addition of:

1. Model Materials Manufacturer
2. Doll House Maker
3. Residential Model Maker
4. Internal Architectural Modeling
5. Toy Model Maker
6. Appliance Model Maker
7. Furniture Model Maker
8. Fixture Model Maker, etc.

	LEVELS: COURSE				LEVELS: GRADE			GOALS ---
AREA CONTENT	I	II	III	IV	K/6	5/9	9/12	WORK
V. ARCHITECTURAL DRAWING FUNCTION, cont'd								f) sander g) electric drill h) fastening agents i) color/painting j) materials 8. Knowledge of landscaping 9. Simulation of proper materials 10. Honesty in design 11. Good function/form

GENERAL for the WORLDS of :

171

RECREATION	LIVING	RELATED
404		405